NATUR CYMRU
Nature of Wales

Number/Rhif 31 • Summer/Haf 2009

- Farming, FWAG and wildlife
- Flowers, flies, frogs and fishes
- Anglesey grazing
- Countryside clutter
- Mammal monitoring
- Newid rheolaeth
- Competition winner - polecats
- Books, News, Comment...

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NATUR CYMRU
The Nature of Wales

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Bwriedir i *Natur Cymru* hyrwyddo a chyfnewid gwybodaeth am fioamrywiaeth a hyrwyddo dadl. Os oes gennych wybodaeth, erthyglau neu waith celf y credwch a allai fod o ddiddordeb i'r darllenwyr, cysylltwch â'r Golygydd os gwelwch yn dda.

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Natur Cymru is intended to promote the exchange of information about biodiversity and encourage debate. If you have information, ideas for articles or artwork which you think might be of interest to readers, please contact the Editor.

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NATUR CYMRU GOLYGYDDOL

Yn gynharach eleni, cynhaliodd Yr Ymddiriedolaeth Genedlaethol arddangosfa o waith Charles Tunnicliffe, a siaradodd Philip Snow am yr arlunydd byd natur gwych. Daeth Tunnicliffe yn boblogaidd iawn oherwydd y lluniau a wnaeth ar gyfer 250 a mwy o lyfrau, ond efallai na chafodd y ganmoliaeth artistig a haeddai. Ys dywed Philip, caiff adar marw, sy'n eithaf hawdd eu darlunio, eu hystyried yn gelfyddyd; ond nid yw'r dasg anodd o gyfleu bywyd yn cael yr un bri.

Ganed Tunnicliffe i deulu eithaf tlawd o gefndir gwledig. Gwyddai'n iawn beth oedd gwaith caled, oherwydd ar ôl dod adref o'r coleg bob diwrnod âi ati i odro'r gwartheg â llaw. Roedd ei agwedd at ei destun yn glir, syml a disentiment. Rhyfedd yw meddwl bod y cyd-destun rydyn ni'n debygol o ystyried byd natur ynddo rŵan ag arlliw o euogrwydd, colled a sentiment yn perthyn iddo.

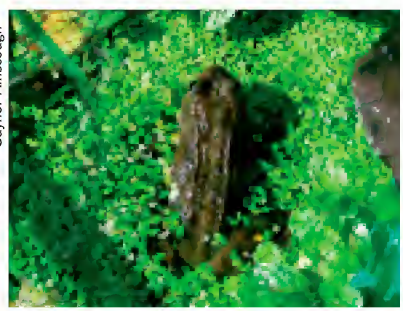
O'n herwydd ni, mae natur yn encilio. Dyma broses ddidostur sy'n rhoi tirfeddianwyr a rheolwyr tir mewn sefyllfa anodd iawn. Yn ôl Glenda Thomas, mae llawer o ffermwyr yn gadwraethwyr pybyr, a hawdd iawn yw tanbrisio eu hymdrechion. Ond mae ffactorau economaidd yn dal i ffafrio'r arfer o 'ddatblygu' tir. Mae pob dirywiad a ddaw i ran bioamrywiaeth, pob lliw llachar a gaiff ei bylu, yn dylu ac yn lleihau natur arbennig y dirwedd, a hynny heb inni sylwi. Yn ddiweddar, clywais sôn am ollwng sbwriel ar safle fferm fechan mewn dyffryn ac am aredig SoDdGA, gan droi'r carped o glychau'r gog a oedd yno'n ddim byd ond glaswellt.

Yr hydref diwethaf, daeth y Pwyllgor Dethol ar Archwilio'r Amgylchedd i'r casgliad na fydd y Llywodraeth yn llwyddo i gyrraedd y targed o roi stop ar golli bioamrywiaeth erbyn 2010, a bod angen dull newydd o roi diwedd ar y dirywio dramatig. Does yr un gwleidydd wedi ymdrechu'n galed i ymddiheuro am hyn nac i ddwyn y Llywodraeth (a'r Cynulliad) i gyfrif. Diolch i'r drefn, mae llawer o gynefinoedd yn cael eu hadfer, ond a fydd yr holl waith caled yn ddigon i ddatrys y broblem?

Ceir dwy erthygl yn croesawu cynllun amaeth-amgylcheddol symlach, o'r enw Glastir. Yn 2012, bydd hwn yn disodli'r cynlluniau presennol. Dylai arwain at fwy o fuddion amgylcheddol a dylai ffafrio mwy ar y ffermwr. Ond go brin y bydd cyllideb o bron i £90 miliwn yn ddigon i ysgafnhau'r pwysau economaidd mawr sy'n troi golygon ffermwyr i'r cyfeiriad arall. Ar adeg pan mae cynhyrchu cymaint o fwyd ag y gallwn mor bwysig, a phan nad yw'r gwleidyddion na'r cyfryngau yn rhoi fawr o sylw i fioamrywiaeth, y cwbl y gallwn ei wneud yw gobeithio'r gorau.

Yn fwy nag erioed o'r blaen, rydyn ni angen dychymyg a hyblygrwydd – dau beth sy'n nodweddu Partneriaeth Anifeiliaid Pori Ynys Môn, fel y dywed Hilary Kehoe. Pan ddaw ffermwyr a chadwraethwyr ynghyd mewn ysbryd o ewyllys da, rywsut gall problemau dyrys ddiflannu'n ddim.

Wrth fonitro llygon y dŵr a mamaliaid bach eraill, sylwodd Rob Parry ar bethau hynod iawn; a'r ffwlbart sy'n mynd â bryd ail enillydd y gystadleuaeth 'Natur yn ysbrydoli'. Dywed Peter Ogden ei fod yn casáu annibendod trefol sy'n anharddu cefn gwlad; ac afonydd yw testun erthygl ddiddorol ac ingol gan Pat O'Reilly. Gobeithio y gwnewch chi fwynhau darllen am brofiadau pobl eraill sy'n gweithio er budd cefn gwlad Cymru. Gobeithio hefyd y cewch chi brofiadau tebyg eich hun y gallwch eu trysori am byth.



Gaynor Ainscough

James Robertson

NATUR CYMRU EDITORIAL

Earlier this year the National Trust hosted a celebratory exhibition of the work of Charles Tunnicliffe, which included a talk about the great wildlife artist by Philip Snow. Tunnicliffe's paintings and illustrations in more than 250 books won him a huge following, but perhaps not the artistic acclaim he deserved. As Philip pointed out, dead birds, which are relatively easy to depict, can be art, but capturing life itself, so hard, is considered mere illustration by the art world.

Tunnicliffe was born into relative rural poverty, and knew all about hard labour, coming home from college each day to hand milk the cows. His approach to his subject matter was clear-eyed, uncomplicated, without sentimentality. It is disconcerting that the context in which we now view and depict nature is tinged with guilt, loss and sentiment.

The natural world is receding in the face of human demands. It is an inexorable process, which places landowners and managers in a most difficult position. As Glenda Thomas says, many farmers are true conservationists, and it is easy to undervalue their conservation efforts. But economics still favours the 'development' of land. Each small reduction in biodiversity, each bright pixel discoloured, imperceptibly dulls the face of the landscape. Recently I have heard of the ploughing of an SSSI, of a hillside, once blue with bluebells, now converted to green sward, and of a small valley farm drained and dumped on with rubbish.

Last autumn the Environmental Audit Select Committee concluded that the Government would fail to meet its target of halting biodiversity loss by 2010, and needed a new approach to stop the dramatic decline. Politicians have not been falling over themselves to apologise or hold the Government (and Assembly) to account. They are many good news stories about habitats being restored, but even these efforts are not equal to the scale of the problem.

Two articles welcome the announcement of a single, simplified agri-environment scheme, Glastir, to replace the existing ones, in 2012. It should bring greater environmental benefits through efficiency, and be more farmer-friendly. But even a budget of nearly £90m is unlikely to counter the much greater economic pressures which point farmers in the opposite direction. We must hope for the best at a time when talk is again about the need for maximum food production, and biodiversity has dropped off the radar of politicians and the media.

More than ever we need imagination and flexibility, two hallmarks of the Anglesey Grazing Animals Partnership, the subject of Hilary Kehoe's article. When farmers and conservationists get together in a spirit of goodwill, thorny management problems can melt away.

Rob Parry has made some extraordinary observations during his monitoring of water shrews and other small mammals. The polecat captures the imagination of the second of our 'Inspired by Nature' competition winners. Peter Ogden abhors the urban clutter which disfigures the countryside, and our rivers provide material for an entertaining and poignant article by Pat O'Reilly. As always, I hope you enjoy reading about the experiences of others working for and in the Welsh countryside, and have your own ones to treasure this summer.

James Robertson

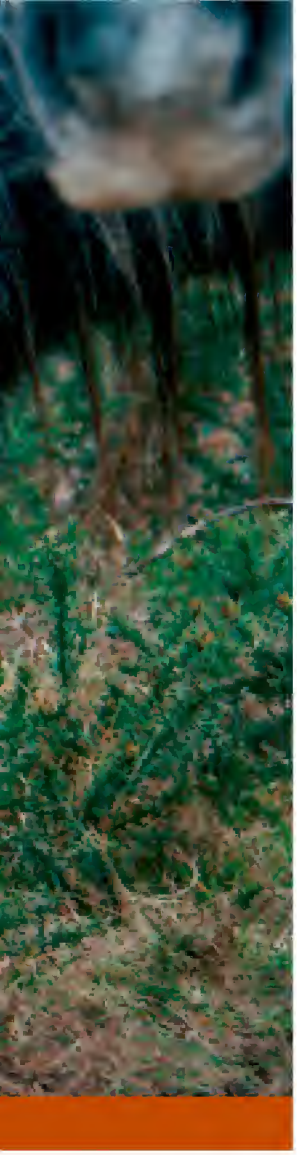
Anglesey Grazing Animals Partnership

Many of our richest wildlife habitats have been under pressure from increasing intensification of land-use. This sometimes obscures the fact that the opposite process can be just as problematic. Agriculture has moved away from many difficult open habitats – old grasslands, heaths and fens, for example – because they can be difficult to manage, and ultimately uneconomic. The Anglesey Grazing Animals Project is bringing back grazing animals and helping farmers, as ***HILARY KEHOE*** *explains.*

All images: Hilary Kehoe

I am the Anglesey Grazing Animals Partnership (AGAP) Ynys Môn local grazing scheme coordinator and am a third of the way through a three year mission - to boldly graze where no one has grazed before (or not for many years anyway!). I've come into the job from a background of conservation-friendly farming and countryside contracting, so I hope to be able to bridge the gap between the farming and conservation interests on the island to bring a minimum of 300 hectares of land on 30 sites under sustainable grazing management, through working with the farming community, landowners and managers.

My role as coordinator is to do whatever it takes to make grazing possible, so a 'grass roots' approach is adopted, following the process through from start to finish. There may be a variety of reasons why a



site is not grazed, ranging from lack of infrastructure, local resistance to changes, or difficulties finding appropriate livestock. Some factors are the same everywhere but some sites require creative solutions (and cookery, but more of that later).

The ruminant browsing animal evolved and flourished originally in those regions of the world where scrubland, heath and wild grazings were then to be found.
Progressive Farming *by R Alun Roberts, Ed. J.A Hanley 1949.*

This farming manual goes on to discuss how, although science advocates re-seeding and sowing with newly developed hybrid pasture mixes: "By virtue of the various miscellaneous weeds and herbs that are usually found in old swards providing some mineral, or else some other virtue hitherto unknown to us, and not found within the narrow range of species present in the ley sward, the old sward has the power of turning unthrifty beasts and conditioning them anew."

Grazing animals are invaluable in maintaining or increasing biodiversity in a variety of habitats. Semi-feral or unhandled ponies are useful at creating pathways and browsing gorse and scrub to open up an area: walkers don't find them too threatening as they avoid the public and get on with their grazing job.

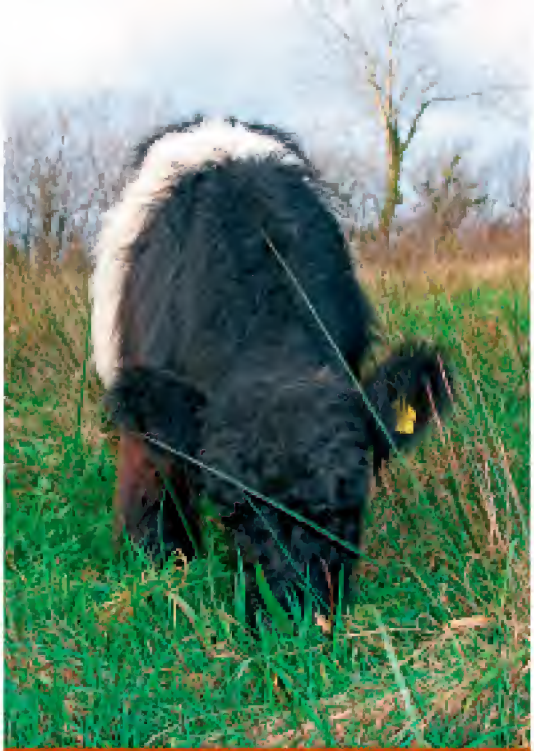
Cattle are often the best choice for conservation grazing management: they leave a more variable, taller sward that sustains more invertebrates than sheep or ponies. They eat a wide range of coarse vegetation so they spread the effects of grazing evenly and open the sward for colonisation by a variety of plant species. They are useful in eating the growing shoots of *Nardus* or mat grass and purple moor grass and browsing scrub. They produce copious amounts of dung – up to four tonnes per cow a year – which nurtures an annual insect population a quarter of the cow's own body weight. Their hoof prints and the edges of the paths they create provide niche environments for small plants and creatures such as marsh fritillary caterpillar.

AGAP is a partnership between PONT (Pori Nature a Treftadaeth), CCW, The National Trust, RSPB, North Wales Wildlife Trust, FWAG and the Sustainable Development Fund. The coordinator is supported by the Esmée Fairbairn foundation through PONT. There are an estimated 3000 hectares of land with wildlife value on Anglesey, some of which are in need of grazing management to improve habitats and restore the areas to favourable condition for the Wales environment strategy outcome 21: AGAP was set up to address this issue.

It is good to be bringing them back into these areas, where we can, to promote the natural environment they originally created – and they are more carbon friendly and cost effective than a strimmer.

Traditional breeds

We are encouraging graziers to use slower growing, traditional breeds of cattle which can manage the vegetation and thrive to form part of a viable farm beef enterprise. Hardy Welsh Black, Belted Galloway, Hereford, Shorthorn and Dexter cattle are being grazed on sites suitable for their breed characteristics and grazing preferences. The sure-footed light Dexters, which are very fond of scrub, are grazing an area of limestone and browsing regrowth and rank grass. Quiet Herefords, with a healthy dislike of unruly dogs, are protecting their pony companions and managing an area of coastal heath for chough, whilst hardy, double coated Belted Galloway cattle and hairy Welsh Blacks have spent the winter



Belted Galloway on the Anglesey fens

browsing and wading out on the Anglesey fens and the dunes of Newborough Warren. Thrifty, agile and placid Shorthorns, which can survive harsh conditions and gain weight on coarse, poor quality grazing, will be roaming some well-used headland at Porth Dafarch during the quieter hours of the day, moving back through newly installed gates to neighbouring enclosed land at peak dogwalking times, and spending part of the year restoring another area of nearby heath.

There are constraints to overcome when arranging to graze with cattle. Redwater fever which is carried by ticks is endemic in some areas. Local farmers and vets know where a risk exists so 'hefted' stock (which have immunity to the disease) or animals under six months old (who will develop their own immunity) are used in these places. TB restrictions and cattle movement rules also have to be taken into account but can usually be accommodated. Handling pens are provided when possible and we have access to a mobile system if necessary. As a last resort, a bag of feed and a lorry are always an option. Generally the grazier's main holding is not too far from the site so the two can be linked for movements to reduce paperwork.

Partnership working

Working as part of the Partnership has several advantages. I am able to work on sites owned or managed by all of the Partners if they need help with grazing, and also on privately owned land. This is really useful as it gives flexibility and makes it easier to look at a wider picture. One grazier manages stock on three sites under different ownerships: the areas are all within five miles of his farm and can be worked together so that when one place needs to be free due to visitor pressure or winter poaching, the stock can move to another. It is also possible to link sites for summer or winter use, moving from fens to heathland as necessary. I'm able to see where we can join up the management, and thus the ecology, of areas under different ownership, and make the most of local resources – for example, in harvesting haymeadows.

It is great to be able to use the resources of all the partners, having access to information, maps, expertise and advice on land agency issues, habitat management, site history and ecology across a wide range of specialisms and to tap into the experience and local knowledge from conservation practitioners and the farming community. Sometimes it is useful to be 'neither fish nor fowl' and to be able to approach landowners and graziers with just my PONT hat on.

To date 70 hectares, on a variety of SSSI and non designated sites, privately owned or under the control of organisations in AGAP, are being managed for wildlife with farmers' cattle, sheep or ponies, with a further 100 hectares in progress. The farmers themselves are becoming a rare breed, and balanced conservation must include and support them as they have the skills, facilities, livestock and local knowledge needed for effective management.

Breakwater Quarry

I was invited to Anglesey Council's Breakwater Country Park in Holyhead by the Warden, Gareth Evans, in September 2008, to look at a two acre area with a view to grazing it lightly as part of a heathland restoration project. Standing in the field, we looked out at the rocky coast, over 10 hectares

Spring squill and orchids benefit from grazing management

of coastal heath stretching from the foot of Mynydd Tŵr to the Holyhead Breakwater, and decided not to stop at two acres but to see if it would be possible to graze the whole area. Working together over the next six months we found that it was.

The coastal area had not been grazed since the horses, working on the quarry and Breakwater in the late 1800s, were pastured there at night, but adjacent improved fields were let out on an annual grazing licence. One hundred thousand visitors a year visit the park or walk through it on the Anglesey Coast path. The heath is in generally good condition but would benefit from some scrub control and heather regeneration; we felt that ponies would be the best animals to graze the area. There is also scope for some restoration work to extend the heath into the improved land in the future. Having researched the history of grazing in the area we held a public information day at the visitor centre, attended by all the partners. Our exhibition gave locals an opportunity to voice any concerns about the proposed grazing.

My cooking came in useful - gingerbread butterflies and ponies were handed out to visitors with the question 'Are you hungry enough to eat a horse?' The North Wales Wildlife Trust volunteers manned the cafe, the grazier brought some ponies to meet the public, and the press, television and radio all gave us coverage. The response from those who came was positive once a few concerns were answered, so we were able to go ahead with drawing up the fencing specifications and appointing the contractor. Funding was secured through grants from CCW and PONT, kissing gates for the footpath supplied by Anglesey Coastal Footpath team and we obtained licences and permissions for work on the SSSI and near the badger sets we found. As a bonus, we were able to improve some boundary fences and remove others to incorporate five hectares of the improved fields into the headland, thereby avoiding pinch points for livestock. A handling pen was constructed in a secure holding to help with routine management of the ponies.

Fencing at the Breakwater Country Park

Section A pony

We have now discussed the management options with the RSPB and CCW, written a grazing policy so that anyone working at the Park can get all the information they need about it, and found a pony breeder with suitable semi-feral Section A Welsh Mountain and Carneddau ponies, and a grazier who tendered for the land and the opportunity to manage them. Signage has been arranged (and destroyed by the ponies!) and monitoring of the site and fixed point photography is ongoing. The Wardens will be given 'looker' training through PONT to help them identify any welfare problems and effectively check the ponies. I will continue to work with the grazier and the wardens to manage the grazing and have my eye on another area for the team to expand into in the coming year.

Working in a team in this way seems to result in the whole being greater than the sum of its parts and, where this can happen, the rewards are well worthwhile.

Practical tasks

On other sites different issues need to be addressed. Agreements with landowners, managers and graziers need to be negotiated. Practical tasks which need to be tackled include sorting fencing, which is usually in need of repair or replacement; providing water-scrapes, dew ponds, bowsers or troughs across the site to encourage the stock to graze evenly across it instead of always congregating in the same place; gorse and bramble cutting to provide escape lines for animals; and discreet safety fencing at pinch points where stock could be pushed near cliff edges. On a recent visit to a coastal site where all the above had

Chough

been arranged by AGAP, it was very exciting to see a pair of choughs feeding on the excavated scrape edges and courting on the grassland amongst the dung of contented cattle and ponies.

Two graziers are soon to start managing heathland and fen areas with Welsh Black cattle: one, who was unwilling to risk cattle straying when visitors left the gate open, is to have a cattle grid installed and is being encouraged to manage cattle on two sites through a farm business tenancy, supported with funding through a Section 15 management agreement. I have helped the other couple to apply for single farm payment to increase their income from their own land; they will then manage a new, small herd of heifers to graze an area of fen in the summer and dry heath in the winter, possibly financed through a PONT livestock leasing scheme.

Not all sites need such a hands-on approach; sometimes all that is needed is a listening ear, a grazier contact, or help with making a plan.

I'm really enjoying my work – every day is different, I meet lots of interesting people, get to spend quality time with cattle and am privileged to work in so many beautiful and inspiring places.
Grazing management is reaping conservation benefits but is not sustainable unless the livestock are able to provide a decent income for farmers. So as AGAP moves into its second year the other targets need to be addressed – forming a farmers' cooperative to market produce from conservation land, spreading the word about grazing, and building on what we have achieved to date. I hope to be able to rise to the challenge, live long and prosper!

***Hilary Kehoe** with husband **Andy** have run an upland sheep and suckler farm for 25 years and also graze mixed livestock on Morfa Madryn, one of the most important lapwing sites in Wales: they were selected as RSPB agri-environment heroes this year for their work there.*

Oes gwartheg eto?

Ar Ynys Môn, sefydlwyd AGAP er mwyn adfer pori ar rhyw 300 hectar o dir sy'n werthfawr i fywyd gwyllt. Mae'n bwysig canfod da byw addas; gall merlod bori prysgwydd ac agor llwybrau tra bod gwartheg yn taclo llystyfiant garw ac yn creu tywarchen anwastad - mae eu carnau hefyd yn creu cilfachau bychain ar gyfer bywyd gwyllt. Ac mae dom gwartheg hefyd yn cynnal poblogaeth anferth o drychfilod sy'n pwyso chwarter pwysau buwch!

Caiff porwyr eu hannog i ddefnyddio hen fridiau fel gwartheg duon Cymreig, gwartheg byrgorn a Dexters. Gan fod pob brid â'i nodweddion arbennig rhaid ystyried pa rai sydd orau ar gyfer gwahanol safleoedd. Ar draws Ynys Môn mae'r gwartheg hyn wrthi'n dawel yn adfer gweundir, yn atal prysgwydd rhag tagu palmant calch ac yn cynnal glaswelltir byr ar gyfer brain coesgoch. Rhaid ystyried cyfyngiadau fel haint dŵr coch a TB wrth drefnu pori gyda gwartheg - ond gellir gorchfygu'r rhain fel arfer.

Mae gweithio mewn partneriaeth yn help garw. Mae'n cynnig hyblygrwydd i fedru symud stoc o gwmpas pan fydd angen ac i gysylltu safleoedd ar gyfer pori haf a gaeaf. Mae hefyd yn fodd i rannu profiadau a gwybodaeth. Gwaith hanfodol y cydlynydd yw meddwl yn greadigol am atebion, pontio â gwahanol bartneriaid ac unigolion ac ymddangos yn ddi-duedd wrth drafod gyda deiliaid tir.

Mae pob safle'n gofyn am raglen wahanol o weithgareddau – o holi barn cymuned ynglŷn â phori darn o arfordir a fu'n segur ers dros canrif, i negodi gyda deiliaid a rheolwyr tir, trefnu gwaith ymarferol fel trwsio ffensys, creu pyllau yfed, gosod cafnau, torri mieri a gosod gridiau gwartheg a hyd yn oed helpu unigolion gyda cheisiadau am daliadau fferm sengl a threfnu hyfforddiant fel y gall rheolwyr tir gadw llygad ar gyflwr y da byw. Ond weithiau, cynnig clust i wrando yw'r peth pwysicaf oll. Y cam nesaf cynhyrfus gyda'r prosiect hwn fydd ffurfio menter gydweithredol i farchnata cynnyrch o diroedd cadwraeth.

Kate Williamson

Newid rheolaeth, newid byd?

Morfa Harlech

Twyni tywod. I'r mwyafrif mae tywod yn codi atgofion am hafau hirfelyn tesog ar draethau euraidd, cri gwylanod, chwerthin plant a hufen iâ. I rai fel ***ANGHARAD HARRIS****, sy'n Swyddog Addysg gydag Awdurdod Parc Cenedlaethol Eryri, mae yna ryfeddod yn y gronynnau melyn yma a'r modd y maent yn gallu newid ardaloedd. Yn yr erthygl hon mae'n disgrifio rhywfaint o ecoleg twyni tywod ac yn edrych yn arbennig ar ddeinameg twyni yn ardal Harlech a'r gwaith arbrofol sydd wedi bod yn digwydd yno.*

Beth sydd gan Aberffraw a Chynffig yn gyffredin? Beth sydd yn cysylltu Llys Rhosyr (Niwbwrch), Castell Ogwr, Candleston a Threganllaw (Pen y Bont ar Ogwr)? Pa gyswllt sydd gan y Bardd Cwsg â thywod?

Wel dyna ran o'r ateb yn y trydydd cwestiwn - Tywod, ac yn benodol twyni tywod - a dyna ddigon o gwestiynau.... am rŵan.

Claddwyd porthladdoedd Aberffraw a Chynffig gan dywod a chwipiwyd o'r môr ac o dwyni gerllaw gan stormydd mawr ddechrau'r 1330au. Yn yr un cyfnod cofnodwyd fod tywod wedi gorchuddio Llys Rhosyr, Niwbwrch, a bod tiroedd Maenordy Candleston a phentref Treganllaw wedi diflannu dan y gronynnau euraidd. Ac Ellis Wynne y Bardd Cwsg? Claddwyd ef ym mynwent Eglwys Llandanwg yn 1734, eglwys yng nghanol twyni tywod a gaiff ei hail gladdu gan dywod yn gyson bob blwyddyn ers hynny.

Mae'r deunydd melyn cras sy'n rhoi blas bach 'difyr' i frechdanau ar lan môr, sy'n llifo'n rhwydd drwy fysedd ar ddiwrnod braf o haf ac sydd hefyd yn ddeunydd ystwyth i greu cestyll ohono, (er na ellir cymeradwyo

adeiladu castell 'go iawn' arno) wedi creu cryn boendod i bobl ar hyd arfordir Cymru dros y canrifoedd. Ac yn wir gallai'r poendod yma barhau, yn dibynnu ar y modd y dewiswn reoli twyni tywod.

Beth yw Twyni tywod?

Nodwedd arfordirol a gaiff ei chreu gan ddeuawd ddeinamig – dŵr a gwynt - yw twyni tywod.

- Mae'r tonnau a ffurfir gan wynt yn treulio a malurio cerrig a chregyn i greu'r tywod.
- Caiff y tywod ei gludo i'r glannau a'i ddyddodi i greu traethau.
- Lle ceir ardal rynglanw (*intertidal*) eang caiff y gwynt afael ar y tywod a'i gludo ymhellach i'r mewndir. Dyna pam y gall y profiad o sefyll neu gerdded ar lan y môr fod yn un mor bigog ar adegau! Weithiau, o dan yr amgylchiadau cywir, gall ymddangos fel petai'r traeth i gyd yn symud.
- Caiff y tywod ei ollwng pan mae'r gwynt yn colli ei nerth ger rhwystrau a dyna ddechrau creu twyni tywod.
- Mae'r twyni cychwynnol yn gallu bod yn dymhorol iawn gan ddiflannu ar ôl gwyntoedd cryf. Ond pan fydd planhigion yn sefydlogi arnynt fodd bynnag... mae'r stori yn un dra wahanol.

Planhigion y Twyni

Mae'r rhain yn rhai arbennig, nid am fod rhai ohonynt yn brin ac yn werth eu gwarchod, ond oherwydd y modd y maent yn llwyddo i fyw ar y twyni. Mae'r tywod sy'n creu'r twyn yn cynnwys gronynnau mawr, o'u cymharu â'r hyn a geir mewn pridd, felly mae dŵr yn llifo'n syth trwyddo (fel mae unrhyw un sydd wedi creu castell tywod gyda ffos yn gwybod). Rhaid i'r planhigion fedru gwrthsefyll sychder, neu fod yn seroffytig (sero = sych, ffytig = planhigyn) os ydym am fod yn dechnegol.

Mae tywod y twyni hefyd yn hallt ac mae'n cael ei anwylo gan wynt hallt o'r môr. Rhaid i'r planhigion hynod allu gwrthsefyll yr heli - neu fod yn haloffytig (halo = halen).

Mae moresg (*Ammophila arenaria*) yn un o'r planhigion sydd wedi addasu i'r amgylchedd cras hwn. Oherwydd ei ddail hir sy'n troi i mewn arnynt

Angharad Harris

Moresg/marram grass

eu hunain i leihau anwedd trydarthiad ('transpiration') ac i osgoi effaith y gwyntoedd hallt, a hefyd oherwydd y gwreiddyn sy'n ymestyn yn ddwfn i'r ddaear mae moresg yn gallu goroesi, a sefydlogi'r twyni. Mae planhigion moresg hefyd yn atgynhyrchu trwy anfon rhisomau allan dan ddaear. Mae'r rhain yn ymddwyn yn union fel coesyn planhigyn 'pry cop' (*Chlorophytum comosum*) gyda phlanhigion newydd yn egino rai troedfeddi i ffwrdd – proses sydd yn sefydlogi'r twyni ymhellach.

Dros amser, mae'r planhigion arloesol hyn yn newid yr amgylchedd fel y gall planhigion eraill oroesi; mae'r twyn yn heneiddio ac yn sefydlogi ac yn creu rhwystr naturiol rhwng y tir a'r môr. Mae'r broses yn barhaus gyda thwyn newydd yn cael ei ffurfio yn ei dro o flaen y twyn gwreiddiol – sy'n egluro pam fod angen cerdded mor bell i deithio trwyddynt i gyrraedd y môr.

Defnyddiodd merched Niwbwrch y moresg i greu matiau ac roedd yn ddefnydd hyblyg iawn ar gyfer creu toeau gwellt. Fodd bynnag, hyd yn oed yn ôl yn 17eg ganrif, daeth yn amlwg fod yr holl drin a thorri yn cael effaith ar y twyni ac yn eu hansefydlogi. Gyda dim byd i gadw'r tywod yn ei le pan chwythai'r gwynt o'r môr, claddwyd llysoedd, tai a phentrefi gan dywod. Yn 1695 diddymwyd yr hawl i gynaeafu moresg yn yr Alban, ac o 1710 ar dir maenorol arfordirol roedd y landlord yn disgwyl i'w denantiaid blannu moresg. Yn wir, cafwyd dyn o Leet ar arfordir Sefton yn euog o'r drosedd o dorri moresg yn 1727.

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Y twyni'n erydu / Dune erosion

Yn eu hanfod mae twyni tywod yn ddeinamig, yn newid yn gyson o flwyddyn i flwyddyn ac o storm i storm, ac efallai mai dyma un rheswm pam fod gan bobl gymaint o ddiddordeb ynddynt. Deuthum yn ymwybodol o'u rhinweddau yn 1993 pan ddechreuais ddysgu yn Ysgol Ardudwy, Harlech. Yng nghysgod twyni tywod Morfa Harlech, sy'n Warchodfa Natur Genedlaethol ers 1958, roedd yn bosib anfon y disgyblion i wneud gwaith maes ar y twyni tywod o fewn amser gwers ac ar awr ginio, ac roedd y cwrs traws-gwlad yn cael ei redeg ar draws ochr ddeheuol y twyni ac i fyny'r traeth cyn cyrraedd y tarmac a'r ysgol – aw! Ond nid dyma'r unig ddeunydd a wnai pobl o'r ardal ardderchog hon. Un o'r ffyrdd rhyfedda o ddefnyddio'r twyni fel adnodd hamdden oedd rhedeg i gopa un o'r twyni, cyn llithro i lawr wedyn. Mae'n siŵr fod cannoedd wedi mwynhau eu hunain fel hyn, ac o ganlyniad i atyniad naturiol y traeth llydan, y twyni cysgodol, y mannau parcio cyfleus a'r toiledau cyfagos, daeth yr ardal yn Fecca i ymwelwyr bwced a rhaw hefyd. Ac heb unrhyw beth i atal pobl rhag mentro crwydro drwy'r twyni dechreuodd y moresg ddiflannu, a newidiodd yr holl ardal.

Erydiad y twyni

Wrth i bobl lithro i lawr y llethrau serth câi'r moresg a'i wreiddiau eu lladd, gan ddinistrio'r union beth oedd wedi caniatáu i'r twyni dyfu i'r fath raddau yn y lle cyntaf. Heb ddim i'w sefydlogi, dim ond storm o wyntoedd cryfion oedd ei hangen i greu chwythdyllau yn y twyni - a chludo'r tywod ar draws y cwrs golff ac am y castell.

Fioled y cŵn

Bylchau fu wedyn ble bu amddiffyniad naturiol i'r Harlech modern a adeiladwyd ar yr hen gorstir (ar lefel o tua 5m) ble mae'r ysgolion a'r feddygfa, yr orsaf drên a'r briffordd, y pwll nofio, stadau o dai a gwersylloedd carafanio, a chwrs Golff y "Royal St David's". Y twyni a'r llystyfiant oedd wedi bod yn eu hamddiffyn i gyd rhag cael eu claddu gan dywod neu, yn waeth fyth, eu boddi gan y môr. Gyda'r erydiad yn digwydd ar raddfa eang, a'r warchodfa yn cael ei dinistrio, penderfynwyd ar fesurau pendant i achub yr ardal.

Arbrofi ac achubiaeth?

Beth fyddai'n digwydd petai tywod yn cael ei adael yn ddigyffwrdd am flynyddoedd? Pa blanhigion fyddai'n ymddangos a thros pa hyd o gyfnod fyddai gorchudd o lystyfiant yn llwyddo i ffurfio ar dywod? Mae biolegwyr a daearyddwyr wedi astudio'r olyniaeth a welir ar hyd y twyni gan fod modd, trwy gerdded o'r pwynt llanw uchel presennol tua'r mewndir, teithio'n ôl mewn amser gan gofnodi'r math o blanhigion a welir ac yn lle - teithio'n ôl sawl canrif o olyniaeth o fewn 500m. Nod yr ymchwil yma oedd gweld yr olyniaeth yn digwydd, a'i gofnodi fel y digwyddai. Ffensiwyd ardal ymhellach i'r gogledd lle nad oedd ymwelwyr arferol yn mentro a chofnodwyd yn flynyddol rhwng 1980 a 2001 bob planhigyn a ymddangosodd yno.

Erbyn 1980, roedd hegydd arfor (*Cakile maritima*) a helys pigog (*Salsola kali*) yn goloneiddwyr unflwydd ar hyd y llinell o wymon a adawyd ar hyd marc penllanw. Roedd marchwellt y twyni (*Elytrigia juncea*) a moresg yn coloneiddio'r pentyrrau tywod a sefydlogwyd gan y rhain. Dros amser, wrth i'r twyni dyfu a sefydlogi ac wrth i'r amodau sych a hallt gael eu disodli'n raddol gan gyflyrau llai eithriadol, ymddangosodd yr ail reng o blanhigion. Gyda chynnydd yn y deunydd organig a grewyd gan ddail y moresg a'r hegydd arfor a'r gallu cynyddol i ddal lleithder, llwyddodd llysiau'r gingroen (*Senecio jacobaea*), tafod y bytheiad (*Cynoglossum officinale*), clust llygoden gulddail (*Cerastium fontanum*), helyglys a

thywodlys i sefydlu, ac ymddangosodd amranwen arfor (*Tripleurospermum maritimum*) am gyfnod o bymtheng mlynedd. Wrth i'r rhain sefydlu a newid yr amgylchedd diflannodd y mwyafrif o'r coloneiddwyr gwreiddiol. Ddeng mlynedd wedi cychwyn gwelwyd llai a llai o'r moresg a daeth peiswellt coch (*Festuca rubra*) a pheiswellt y twyni (*Vulpia membranacea*), ynghyd â thaglys arfor, fioled y cŵn a mwsogl, i gymryd ei le. Mwsogl ar dwyni sych? Mae'r lle yn frith ohono. Mae'n sefydlu ar dir a noethir gan gwningod a chyda dyfodiad y creaduriaid hyn, a'r gwrtaith ychwanegol y maen nhw'n ei greu, mae dilyniant y llystyfiant yn parhau.

Gyda'r arbrawf yma'n gweithio cystal dechreuwyd ar brosiect i ffensio ymyl y twyni o boptu'r llwybr a arweiniai am y traeth ac ar hyd y morlin, cyn cymryd cam pellach a phlannu moresg yno. Wedi'r cwbl, os am greu twyni sefydlog i fod yn arglawdd naturiol er mwyn amddiffyn Harlech rhag ymosodiad gan y môr, rhaid oedd cael planhigion a gwreiddiau i'w sefydlogi. Tynnwyd lluniau o'r ardal a'r gwaith ac yn yr un modd ag y cofnodwyd y planhigion yn flynyddol yn y plot arbrofol, tynnwyd lluniau fel cofnod o'r newid i ffurf a phatrwm y twyni eu hunain. Cofnod ffotograffig anhygoel o natur ddeinamig y twyni.

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Sefydlogi'r y twyni / Stabilising the dunes

Angharad Harris

JCB ar waith / JCB at work

A chan fod y twyni mor symudol ac oherwydd bod dylanwad y gwynt a'r môr yn parhau daeth problemau newydd i'r golwg. Nid Jac Codi Baw y mae rhywun yn disgwyl ei weld ar draeth ran amlaf, ac eto ar ddyddiau o wanwyn dyna beth a gafwyd ar draeth

Mike Alexander

(caption)

Angharad Harris

Morfa Harlech

The dynamic nature of sand dunes holds a fascination for ecologists and historians alike. The movement of sand on the Welsh coastline has been influential in shaping our distinctive landscape and settlement patterns and has seeped into aspects of our culture. At Morfa Harlech, ecologists and geomorphologists have been studying dune formation and vegetation succession for years, keen to understand what impacts the changes at the coast might have on the adjacent low lying town of Harlech. The shifts in dune patterns and species composition have been recorded annually in some areas, and the recent change in management, which has resulted in the complete removal of an exclosure fence, provides a another opportunity to study a new phase in the history of sand dunes on the Meironnydd coastline.

Harlech. JCB yn clirio tywod a gludwyd dros y llwybr yn y gaeaf yn ôl ar hyd y traeth i ddadorchuddio'r ffens fetel. Ac roedd yn rhaid i'r ffens ei hun gael ei hail osod yn gyson gan fod swmp y tywod yn ei chladdu a'i gwneud yn beryglus i ymwelwyr (effaith pryderon am lechyd a Diogelwch). Y llynedd, fodd bynnag, digwyddodd rhywbeth trawiadol. Na, nid trosglwyddo rheolaeth dydd i ddydd y warchodfa i Awdurdod Parc Cenedlaethol Eryri, ond diflaniad y ffens. Ac nid dros dro. A'r canlyniad? Ar un llaw mwy o ryddid i gŵn a cherddwyr ddarganfod y twyni a'u cysgod ac i blant redeg i fyny ac i lithro i lawr y twyni. Ar y llaw arall, cryn newid ym maint y twyni bob ochr i'r llwybr, effaith y gwynt wrth iddo symud drwy'r twyni i'w weld yn gynyddol gyda llai o orchudd llystyfiant a mwy o dywod yn chwyrlïo o amgylch ac yn llwyddo i lanio yng nghanol brechdanau!

Pam symud y ffens? Roedd y ffensio a'r plannu wedi bod yn or-lwyddiannus, a'r twyni wedi datblygu i fod yn rhy sefydlog. Mae planhigion moresg â'u gwreiddiau hir, sy'n gyfrifol am sefydlogi tywod, wrth eu bodd yn cael eu claddu gan dywod, yn ffynnu dan y gronynnau ac yn tyfu trwyddo gan barhau i sefydlogi'r ardal. Pan nad oes tywod yn cael ei chwythu, mae'r amgylchedd yn newid a gwreiddiau tipyn byrrach sydd gan yr ail reng o goloneiddwyr.

Amser a ddengys pa newid a welwn yn y dyfodol, os bydd twyni'r warchodfa yn gwarchod yr ardal y tu cefn rhag ymosodiad gan y môr. Mae'n dibynnu ar y defnydd a wneir o'r ardal dros yr haf, ar gryfder y gwynt dros y gaeaf, ar symudiad gronynnau bach. Ond beth bynnag fydd y canlyniad i'r twyni deinamig yma - bydd 'na rhywun yno i'w gofnodi.

*Mae **Angharad Harris** yn Swyddog Addysg gydag Awdurdod Parc Cenedlaethol Eryri. Er fod ei swydd wedi ei leoli ym Mhlas Tan y Bwlch mae fel arfer allan yn y maes.....glaw... yn addysgu disgyblion o bedwar ban byd am Eryri - ac yn mwynhau pob munud.*

> *"...y'r hwn a adeiladodd ei dŷ ar y tywod. A'r glaw a ddisgynnodd a'r llifddyfroedd a ddaethant, a'r gwyntoedd a chwythasant... ac efe a syrthiodd, a'i gwymp a fu fawr".* **Matthew 7,26-27.**

Urban clutter in the countryside

The landscape which we cherish is a fusion of natural and cultural history. Yet an aesthetic blindness is blighting the countryside, making it harder to appreciate and enjoy this richness. ***PETER OGDEN*** *champions a more graceful approach to a great rural legacy.*

Seeing double

All photos: Peter Ogden

If you go down to the woods today you're sure of a big surprise – so says the opening line of that well-known Teddy Bears' picnic song.

Although the anticipation and glories of your favourite oak woodland or coastal shoreline may not bring too many new surprises, the journey to them may reveal some interesting sights. There was a time not so long ago when that journey and life in the countryside moved more slowly, when there was so much to see and hear that people made time to stop, look and talk. Country roads and lanes were exactly what the label said, places where there was no need to rush, because if you did you'd miss somebody or something. Snowdrops lined the earth banks in February, primroses in late Spring, bluebells in early summer, all providing a kaleidoscope of colour and a galaxy of smells to lift your spirits.

But oh how things have changed!

Gone are the lengthsmen with their sickles and grindstones, the regional styles of hedges, the yellow and black AA patrol boxes and the manned level crossing. Fewer are the narrow stone bridges with babbling brooks chattering under them and the reassuring sights of those miniature countryside sentinels, the granite milestones.

And what has replaced them... urban paraphernalia creeping down our byways, neon-coated night skies and the cancerous spread of road signs. The diversity and distinctiveness which once characterised each part of rural Wales is fast disappearing, only to be replaced by a 'catalogue countryside', identifiable by its increasing clutter and the standardisation and blandness of those features which once provided distinctiveness to each corner of Wales.

Designed for speed?

For some unknown reason, as cars are made to go faster and speed kills more people, we widen, straighten and build bigger roads to textbook standards. After having done so, what do we do to their mown grass verges and flailed hedges? Plaster them with signs and speed cameras, and their surfaces with every conceivable means of reducing speed. Poorly designed and over-engineered, our new breed of roads is fast eroding the character of the landscape of Wales.

And what of the rest of the countryside? Not only has it been mechanised, grubbed, scrubbed and littered but also galvanised in the process. The materials for gates, fences, sign posts and most agricultural buildings no longer start their life in a local oak wood or limestone quarry but in some aluminium smelter or anonymous agricultural merchant's yard. Surely enough well-designed wooden gates and craftsmen still exist to show that visual bad manners are neither necessary nor inevitable?

Isn't it ironic, indeed alarming, that this is happening when the Welsh Assembly Government is still pumping hundreds of millions of pounds into agri-environmental stewardship schemes, sustainable tourism initiatives and rural community regeneration programmes, all seeking to make Wales a greener and more environmentally pleasant land?

As is becoming ever easier to see, ugliness, like beauty, often comes in small packages and it doesn't take much to ruin a special place. All too often we let it pass; we permit ourselves to believe that small things are not worth bothering about, or that we would make ourselves look foolish or unpopular by making a fuss about them. What is another mini roundabout, a row of street lights or a couple more crash barriers? If we want the convenience of mobile phones then surely we must be willing to give up a hilltop or two for the masts.

The increasing pressures being placed on our landscapes are all good reasons why we must be more, not less, vigilant and not abandon the distinctiveness of our local landscapes to the creeping rash of tastelessness or death by a thousand insulting cuts.

It is because the Council for the Protection of Rural Wales (CPRW) is concerned about this insidious change and the need to safeguard the beauty of the landscapes that we believe that the ugliness created by 'clutter in the countryside' needs to be choked. The battle against clutter and thoughtlessness is not however a battle for prohibition, but for sensitivity and tact. No one is arguing that change should be banned. On the contrary, genuine need should be met, but in the least damaging way which reflects the character and sensitivity of the place where it is needed. Local materials for local circumstances, not cheap catalogue clutter for convenience.

Improved care and stewardship of the countryside can be achieved if a sensitive balance is struck

between design and provision so that both reflect the character of a landscape. Instead of becoming biodiversity barriers, roadsides should be corridors linking and celebrating areas of wildlife and landscape variety.

To reduce clutter is not to resist change or to argue against tackling rural problems, but to insist on a better kind of progress which maintains and enhances the diversity and special qualities of the Welsh landscapes. An uncluttered countryside relies on uncluttered thinking.

Wales cannot afford and does not deserve an uncontrolled weedgrowth of ironmongery in our vales or hillsides. Technology should be the ally not the enemy of a beautiful countryside, and should welcome the challenge of finding elegant, non-intrusive ways of providing the services we need. Those who manage, change or use the countryside must accept that protecting and enhancing Welsh landscapes is just as important as modernising the communication network or promoting economic prosperity. As Sir Clough Williams-Ellis, one of CPRW's founding members quite rightly pointed out, "Beauty and grace should all have their rightful place".

Oh and by the way; the next time you cruise down to your favourite picnic spot or countryside walk, see if you can spot which are more prolific, the primroses or the road signs. Perhaps you'll see what I mean about believing in yesterday!

***Peter Ogden** is Director, Campaign for the Protection of Rural Wales (CPRW).*

Keeping in character

Brwydro yn erbyn undonedd

Mae cymeriad ein lonydd gwledig yn prysur newid. Prin y gwelir bellach y pontydd bychain dros nentydd byrlymus, y cerrig milltir hynod a'r gwrychoedd nodweddiadol. 'Lonydd catalog' unffurf sy'n britho'n tirlun bellach – yn llydan, yn undonog ac yn blastar o arwyddion. Ac mae newidiadau yng ngweddill ein cefn gwlad yn ategu hyn gyda gatiau, arwyddion ac adeiladau metal yn cyrraedd o ffatrïoedd pell neu iardiau masnachwyr yn hytrach na'u bod yn dathlu'r defnydd o ddeunyddiau lleol.

Gall y newidiadau hyn, yn unigol, fod yn fychain ac maen nhw'n digwydd yn raddol. Ond mae'r canlyniad dros gyfnod o amser yn enbyd. Mae YDCW yn ymgyrchu i atal hylldra gwledig. Nid i atal newid, cofiwch, ond i sicrhau bod newidiadau'n cael eu cynllunio gyda mwy o chwaeth a sensitifrwydd fel eu bod yn gweddu â nodweddion gwahanol ardaloedd. Wedi'r cyfan, mae gwarchod hynodrwydd y tirlun Cymreig yr un mor bwysig â gwella rhwydwaith cyfathrebu neu hybu llwyddiant economaidd.

The vital role of mainstream farmers in conservation

All photos: FWAG Cymru

Gareth Vaughan, FUW, & Brian Fairclough discussing hedge management with Glenda Thomas.

Conservationists usually concentrate their attention on the small proportion of farmers who manage land for wildlife, often helped by agri-environment schemes. Does that mean that the majority of farmers have nothing to contribute? Far from it, argues ***GLENDA THOMAS.***

The Farming and Wildlife Advisory Group, FWAG, was set up in 1969 by a group of farmers who had become concerned about the effects of intensive agriculture on the natural environment. This year FWAG celebrates its 40th anniversary, and has grown from that small group of farmers to an organisation with over 9,000 farmer members and 71 Farm Conservation Advisers throughout England, Wales and Northern Ireland. Within Wales, FWAG Cymru was re-established in 2002 and it seeks to stimulate the management of an attractive, living countryside by encouraging the integration of sustainable farming with the conservation or enhancement of wildlife habitats.

It does this by various means, including the following:

- Providing a national forum for discussion of the interaction between farming and the environment.
- Providing leadership to farmers on the importance of the environmental aspects of their production systems, and demonstrating best practice.
- Promoting the view that responsible conservation is an essential part of the farming tradition.
- Maintaining an information and advisory service for farmers so that the

best practices can be applied.

- Developing guidelines for farmers on environmentally responsible techniques, including those for the use of pesticides and fertilisers, resource protection, avoidance of pollution, protection of historical and archaeological sites and the management of access.
- Maintaining its operational income from charitable and other sources while holding itself independent of sectional or commercial interest.

Farmland at Clatter, near Newtown, Powys

FWAG Cymru works closely with other organisations including the farming unions and CLA, and has steering committees comprising farmers and representatives from farming and environmental organisations. Crucially, it maintains its independence with its farmer members and clients who pay for the environmental advice and are assured of confidentiality.

In 1969, food production was the driver for intensification. Today, there are great pressures again to increase food production. Food stores have become depleted by a growing world population, the rising demand for products from developing countries and erratic climatic conditions affecting harvests (although globally stocks of wheat and other grains were replenished in 2008 due to a record-breaking harvest). This is compounded by a focus on addressing some of the issues related to climate change, with land being converted from food to biofuel production. It is timely, therefore, to re-emphasise the importance of ensuring that commercial farming is undertaken in an environmentally responsible manner, with the crucial role of mainstream farmers in conservation recognised, encouraged and financed.

The role of mainstream farmers in managing the land for biodiversity is plainly vital. However, despite this, farmers are not often referred to as conservationists, either by people within their own industry, or by professional environmentalists. Their role as perhaps the most effective conservationists in the country must be recognised if we are to retain the natural beauty of the land and its constituent wildlife. There is much emphasis, and rightly so, on special sites with various designations, and the importance of safeguarding the species and habitats on these sites, often with precise and complicated management requirements. Farmers with such sites on their land often implement these requirements, although they are frequently not as involved as they perhaps should be at the stage where the environmental management plans for these areas are drawn up. However, we must also ensure that all farmers are encouraged in the role they play, not only those with designated sites on their farms.

The agri-environmental set-up in Wales over the past three years has encouraged even the most intensive farmers to become involved in agri-environmental schemes. Joining Tir Cynnal was the first step for many farmers into the world of whole-farm agri-environmental schemes, and not only focused their minds on safeguarding habitats in the broadest sense, but also required participants to prepare resource management plans which cover soil, water and nutrient management issues.

The Minister for Rural Affairs Elin Jones' decision, in October 2008, to halt this scheme was a devastating blow to efforts to ensure that the wider farming community became more involved in environmental management. The Assembly has recently undertaken

Heather moorland at Hafod y Llan, Snowdonia

a consultation on the land management measures provided under Axis 2 of the Wales Rural Development Plan. These measures cover Tir Gofal, Tir Cynnal, Tir Mynydd, Organic Farming and the Better Woodlands schemes. In May 2009 the Minister announced that a new scheme, Glastir, will be introduced. It will have two elements: the first will be open to all farmers in Wales, and the second will be targeted at those areas that can deliver the environmental outcomes considered most important. High on the agenda for consideration are relatively 'new' topics of climate change: carbon capture and water management. Biodiversity seems to be seen as old hat but every effort must be made to include measures in Glastir to address all the important elements. It is excellent that a base-line scheme similar to Tir Cynnal will again be put in place to support farmers undertaking their environmental responsibilities. This scheme is likely to include no capital work element, with the higher tier scheme probably only available to a relatively small proportion of Welsh farmers.

Part-farm schemes

'Part-farm' schemes are another good way of encouraging farmers from every sector of the industry to undertake practical conservation work. These include schemes such as Rhaglen Tir Eryri, Hedgerow Renovation Scheme, Landscape & Conservation Grant Scheme, Natur Gwynedd, and Sustainable Development Fund grants within Areas of Outstanding Natural Beauty (AONB). Such part-farm schemes have proved extremely popular with farmers, where individual projects ranging from hedge laying or planting to pond restoration and dry stone wall repair are funded, usually to a maximum of 50% of the cost. These deliver eco-connectivity, habitat enhancement and historic feature restoration at minimal cost and often serve as a trigger to more environmental engagement. Part-farm schemes can be adapted to include other foci such as flood mitigation, and although they should be available to all farmers, they can be targeted as required.

Whole farm schemes were essential before the advent of cross compliance and Environmental Impact Assessments but now, with habitats already protected by these mechanisms, there is scope for the return of a nationwide part-farm scheme covering a variety of habitats and features. No such scheme currently exists, and the majority of the localised schemes such as Rhaglen Tir Eryri have now come to an end. However, it was of grave concern that there was no provision within the Assembly's consultation document on agri-environment for a part-farm scheme, and Glastir, the new scheme, does not seem to address this. FWAG Cymru, along with others from the industry, has recommended that this be given serious consideration.

The Forestry Commission Better Woodlands for Wales grant scheme is available to farmers with woodlands. Uptake for small scale woodland management on-farm under the scheme has to date been low. However, the Forestry Commission, along with Coed Cymru, has gone some way to addressing this by piloting a simpler scheme, with much less red tape, which has been enthusiastically taken up by the farming community.

Glastir

Glastir payments are due to start in 2012. Tir Cynnal and Tir Gofal schemes are now closed. There are 960 or so farmers who lodged their applications to the

scheme in 2006 still without a Tir Gofal agreement. They have been told that their applications will not be honoured – as has already been the fate of the Tir Cynnal scheme (May 2008) applicants. This is a great disappointment and marks what could be a serious slow-down in environmental management measures undertaken on farms throughout Wales over the next three years until Glastir payments begin.

The 2008 FWAG Cymru – *National Grid Silver Lapwing Farm Conservation Award* winners demonstrated how varied the type of farming enterprise supporting wildlife in a commercial farming context can be. The regional winners comprised a mix of organic and conventional farmers, and although two of the winners were in Tir Gofal the third was not in a whole farm scheme, but had undertaken many practical conservation projects with some financial support from part-farm schemes available in his area over the years.

It is becoming increasingly apparent that farmers will play a pivotal role in the provision also of 'new' ecosystem services such as flood mitigation and carbon management. Members of FWAG Cymru's premier membership scheme, FWAG Cyntaf, have recently participated in a process that calculated carbon dioxide equivalent emissions from their farms, in partnership with Professor Gareth Edwards-Jones and his team at Bangor University. Analysis of results gives each farm a specific figure or value that allows comparison between farms with different enterprises, working at different scales, and between organic and conventional systems. These results can be used as an important starting point on the reduction of carbon dioxide equivalent emissions from farming. Much farmland is important as a carbon sink, and a greater emphasis on farmers' role in carbon sequestration, or locking-up of carbon, is likely in the future.

Through initiatives like the Farm Conservation Awards, FWAG Cymru works hard to highlight the huge amount of conservation work undertaken on farms. The public benefit is immense, but there is every danger of farming continuing to be undervalued, under appreciated and taken for granted. Every opportunity must be taken to demonstrate the value of the range and standard of services provided by the industry in terms of both environmental management and food production, as well as its contribution to public benefits ranging from nutrient cycling, air quality, recreation and tourism, aesthetic, historical and cultural heritage. It is imperative that we, as a society, place a greater value on conservation and associated ecosystem services, and are willing to put a realistic financial tag on the work involved in delivery.

***Glenda Thomas** is Director of FWAG Cymru*

Gweld gwerth mewn gofal

Gyda phwyslais cynyddol ar yr angen i dyfu bwyd ac ymateb i her newid hinsawdd drwy dyfu cnydau tanwydd mae gofyn i bob ffermwr masnachol amaethu mewn ffordd sy'n gydnaws â'r amgylchedd – nid yn unig y rhai sydd â safleoedd arbennig ar eu tir. Mae cynlluniau amaeth-amgylcheddol ar gyfer ffermydd cyfan yn gymorth mawr; mae'n dda bod Glastir yn bwriadu cynnig cyfle i *bob* fferm gynnig am gynllun lefel sylfaenol, a allai fod yn gam cyntaf i lawer i mewn i fyd amaeth-amgylcheddol. Mae cynlluniau ar gyfer rhannau o fferm, fel Rhaglen Tir Eryri a'r Cynllun Adfer Gwrychoedd, hefyd yn help i dargedu gwaith er lles bywyd gwyllt a thirlun - ac i annog pob math o ffermydd i chwarae rhan. Ond gwasgaredig a byrhoedlog yw'r cynlluniau hyn fel rheol, ac mae'n drueni na fu trafodaeth am greu cynllun rhan-fferm cenedlaethol fel rhan o'r ymgynghoriad ar ddyfodol taliadau amaethyddol.

Bydd ffermwyr yn allweddol i ddarparu gwasanaethau 'newydd' sy'n seiliedig ar ecosystemau, fel lliniaru llifogydd a rheolaeth carbon. Bu rhai o aelodau FWAG yn mesur allyriadau carbon o'u ffermydd er mwyn gallu cymharu gwahanol ddulliau a graddfeydd o ffermio, a systemau organaidd a chonfensiynol. Mae'r gwaith hefyd wedi creu gwaelodlin da er mwyn mesur newid yn y dyfodol. Mae amrywiaeth a safon y gwasanaethau a gynigir gan amaethwyr yn bwysig i ni i gyd – rhaid i gymdeithas yn ei thro roi mwy o werth ar gadwraeth a gwasanaethau ecosystem a thalu pris teg amdanynt.

Richard Becker

The F-Words: Flowers, Flies, Frogs and Fishes

Frog calling

***PAT O'REILLY** heaps praise on initiatives that are spreading with alien rapidity.*

Small earthquake in Turkey; no one hurt – hardly headline news! *Small turkey hurt in earthquake* – 'Not interested', say the writers at Reuters.

The overused aphorism 'No news is good news' may seem to be saying innocuously, if somewhat laconically, 'There's nothing to worry about', until we tease out its treble entendre. Can we really rest assured that if things were going seriously wrong in the natural world we would get to hear about it soon enough? A second interpretation is 'ignorance is bliss'. As for the third, is it necessarily the case that 'only the very bad happenings in life are newsworthy'? Is good news of no real interest to people?

News media give scant space to the natural world, and next to none if you discount doom-laden reports of plant and animal extinctions, global warming and climate change. Whoever thought such a mild term as 'climate change' would grab media attention? Surely 'climate chaos'

says so much more. Change is inevitable: accept and welcome it, we are continually urged. But who would welcome chaos into their lives?

Now back to those wild turkeys which, pushed to the brink of extinction a century ago by hunting and habitat destruction, were saved by one of the USA's few successful reintroduction programmes. We have had a few successes of like kind over here... but then again, too few to mention. John Milton's *Paradise Regained* is a work of fiction; the work to conserve our precious natural resources has to be founded on evidence-based scientific fact. Species loss is permanent.

Closer to home, but in far off days more than half a century ago, a small boy would run the last meadow on his way to a stream that wound its way through permanent pastures (at a time when history justified use of the word 'permanent'), in excited anticipation of casting a fly to wild trout more aware of his habits than he was of theirs. Once over the stile he would sit on the fence, watching for water voles, frogs and newts, dippers and wagtails, the occasional otter, but mainly marvelling at the rings of the rise as fish fed on mayflies, stoneflies, caddis and hordes of other aquatic and terrestrial bugs and beetles. This was the prelude to tackling the tangle of thistles, brambles and nettles before sliding in to the stream, there to tangle with the vast range of species on offer.

Willows and alders dominated his catch, along with purple loosestrife, hemp agrimony, flag irises, marsh woundwort – and then one summer's day a newcomer, an orchid-like beauty of a flower with succulent stems and perfect leaves. That may have been the day he caught a trout: well worth the scores of scratches and stings between the boy's short trousers and the tops of his leaky wellies.

First, the Bad News...

That small boy has gone. But Youth has not gone alone: gone too are the thistles, nettles and brambles, choked by the orchid-like alien, Himalayan balsam. Gone the same way are the marginal stands of purple loosestrife and marsh woundwort. Maize has replaced the pastureland, and the bed of the stream is now lined with a shroud of suffocating silt so deep that trout cannot spawn in the gravel beneath. Few kinds of insect larvae can live there either, now that the steamers of water-crowfoot have died, and flag irises and branched bur-reeds no longer offer homes for dragonflies and damselflies. Amphibians and reptiles, birds and small mammals – all have declined in numbers or departed altogether. A chain – and especially a food chain – is only as strong as its weakest link. Even with a lifetime's learning it is now very difficult to catch a trout on that stream.

There is no fence there now. The time for sitting on the fence is long gone, too.

And yet superficially the scene today in that little valley is still one of rural peace and serenity, every bit as peaceful and serene as the Romanian dictator Nicolae Ceauşescu the last time we saw him, on Christmas Day 1989. And quite as dead. But, while few mourned the passing of the Ceauşescu regime, the death of so many of our streams is a concern to many people. It would be a concern to many more if only they knew its true significance. Dead insects go unnoticed: dead silence does not.

In *A Sense of Wonder*, Rachel Carson (she of *The Silent Spring*) urged parents to take their young children to wild places, to introduce them to the

Peter Jones

Marh woundwort / *Stachys palustris*

astonishing variety of life that exists all around us. (Too much of a child's subsequent education, she warned, is devoted to dimming that 'clear-eyed vision, that true instinct for what is beautiful and awe-inspiring'.) Doing so, adults would in turn rediscover the 'excitement and mystery of the world we live in.'

...And Now the Good News

Well, here in Wales in particular, that is exactly what is happening. It is good news, surely, but to make it newsworthy we may have to rework some chapters in the history of our murky past.

Wales may have got off lightly compared with more densely populated countries. Even so, long stretches of moorland brooks were dredged to improve land drainage (incidentally exacerbating flooding in lowland towns), and thousands of kilometres of hill streams suffered lethal doses of pollution – lethal,

Peter Jones

Meadowsweet at Cors Erddreiniog

that is, to the insects and other invertebrates that inhabit such places. With no flies to pollinate flowers and to feed the fishes, amphibians and small birds, the only lasting evidence of these silent killers is their legacy of long-lasting silence.

How could we have known how fatally toxic those pesticides would turn out to be in the water environment, or how difficult it would be to prevent sheep dip entering watercourses? We were not routinely monitoring our streams in ways that would detect such problems.

converging on the main stems of a green leaf, but a photograph is merely a static view and there the similarity ends. Sap enters a leaf via its stem, connected through a twig, a branch, a trunk to the heart of the tree, its roots. Dead leaves do not necessarily mean that the tree is dead. But the life blood of a rain-fed river flows down from its dynamic heartland via that network of hill streams and moorland brooks. A severe heart attack can be fatal.

Good news – hold the front page! The EU Water Framework Directive offers an opportunity to base monitoring and management on the *effects* of pollution and other forms of damage rather than merely on the concentrations of individual pollutants and the physical evidence of deterioration. Now all we need are the resources to do the monitoring and, where necessary, the habitat restoration work.

Photographed from on high, hill streams and moorland brooks appear like pale veins

Knights in Green Armour

The timing could hardly be worse. Yet another unaffordable claim on the public purse? Not necessarily! Here is some really good news: enter the knights in green armour, much-needed reinforcements for the beleaguered Conservation Team Wales.

Two initiatives that have grown steadily in recent years are The Rivers Trust movement (**www.associationofriverstrusts.org.uk**) and the Riverfly Partnership (**www.riverflies.org**). Nowhere is the support for these initiatives stronger than here in Wales.

The birth of a coordinated Rivers Trust movement can be traced to a seminal meeting held in Ceredigion a quarter of a century ago. At that time river improvement groups were forming on the Tweed in Scotland, the rivers Ribble, Eden and Tamar in England, and on the Teifi in Wales. It was the beginning of a process of sharing experience, expertise and learning resources, and promoting best practice that today supports the work of 30 or more active groups on rivers in England, Ireland, Scotland and Wales.

Pat O'Reilly

Water crowfoot *Ranunculus fluitans*

Theirs is not a one-size-fits-all culture: the work is tuned to the needs and priorities of their catchments. Invariably, however, this includes practical actions to restore and protect riparian and aquatic habitats of rivers, streams and lakes; environmental education via direct involvement in projects to monitor, protect and improve water environments; and promoting increased understanding and enjoyment of the natural world.

Each year through the eight Rivers Trusts in Wales, several thousand people become actively involved in learning about and caring for their local water environments. Schools, Scout Groups, Young Farmers' Clubs and many other community-based groups immerse themselves (often quite literally) in the work of Rivers Trusts. In so doing, they also learn how they can change their own behaviour, subtly or radically, to live in greater harmony with the rest of Nature. Oh yes - and how they can help control those invasive alien weeds.

Since the licence for sale of the most deadly toxic of dipping chemicals – those based on synthetic pyrethroids – was suspended in 2006, Nature has begun reclaiming her lost territory. This sad episode, perhaps more than any other, has raised the profile of the Riverfly Partnership. Not surprisingly, this partnership is closely linked with the Rivers Trust movement as well as charities such as Buglife, the Salmon and Trout Association, the Freshwater Biological Association, the Field Studies Council... I should not have started this list: at least fifty partners from the public, private and third (voluntary) sectors are

now backing this UK-wide initiative.

River Invertebrate Monitoring

In one of the Riverfly Partnership programmes known as the Anglers' Monitoring Initiative, professional tutors deliver workshops to fishing clubs committed to establishing groups that will monitor the biological quality of their local waters. Professional entomologists within the Riverfly Partnership have also produced a range of beautifully illustrated identification guides, which are available from the Field Studies Council (**www.field-studies-council.org**).

Some 250 volunteers are now monitoring the quality of rivers and streams by regularly sampling the fly life abundance and diversity. Their data are being made available to the over-stretched professionals in The Environment Agency, Countryside Council for Wales, Natural England and Scottish Environmental Protection Agency.

Richard Becker

Mayfly

The small boy who loved the natural world had a lot to learn. He loved living *with* Nature; now he is trying to learn how to play his part *within* Nature. He could not survive without a complex network of life-long relationships with many other players. Anything he does that threatens the future of flowers, flies, frogs or fishes (or creatures beginning with letters other than 'f') threatens his life-support system and is another step towards suicide. He knows that, and he is helping to spread the news. Now we're talking turkey!

*Writer and broadcaster **Pat O'Reilly** has lived in West Wales for the past 30 years. A council member of CCW, he is also managing director of First Nature, a publishing company specialising in wildlife, ecology and countryside topics. In 2002 Pat was awarded an MBE for his contribution to conservation and fisheries in Wales.*

Torchi llewys dros y gwlyb a'r gwych

Ar hyd a lled Prydain mae golygfeydd gwledig, sy'n arwynebol mor hardd a di-gyfnewid, yn cuddio trychinebau'r degawdau diwethaf. Bu cynefinoedd a rhywogaethau'n dirywio a diflannu ar raddfa ysgubol. Prin yw'r sylw a gafodd y newidiadau hyn – wedi'r cyfan, 'dyw'r amgylchedd ddim yn 'stori newyddion' fawr fel rheol. Tybed a fyddai mwy o bobl yn pryderu pe baent yn gwybod am arwyddocâd y newidiadau i'w bywydau nhw?

Yma yng Nghymru, llwyddwyd i osgoi'r dinistr amgylcheddol enbyd a welwyd mewn gwledydd mwy poblog. Ond mae llygru a gwenwyno dŵr, a cham-reoli tir yn rhan o hanes trist ein gorffennol ninnau hefyd. Mae Cyfarwyddeb Fframwaith Dŵr yr UE yn gyfle i seilio monitro a rheolaeth ar effeithiau llygredd a gweithgareddau niweidiol eraill. Ac mae dwy fenter wedi ymateb i'r her. Mae Ymddiriedolaeth yr Afonydd, a gychwynnodd yng Ngheredigion 25 mlynedd yn ôl, bellach yn cynnwys 30 grŵp ar draws Prydain sy'n rhannu profiad, arbenigedd, adnoddau ac yn hybu ymarfer da. Anghenion a blaenoriaethau'r gwahanol ddalgylchoedd sy'n penderfynu ar y gwaith - sy'n gymysgedd o dasgau ymarferol i adfer cynefinoedd dyfrol, addysg amgylcheddol a hybu dealltwriaeth a defnydd cyfrifol. Mae miloedd o bobl bob blwyddyn yn cyfrannu at weithgareddau'r 8 grŵp yng Nghymru.

Mae cefnogaeth gref i waith y Riverfly Partnership ar draws y DU. Mae wrthi'n hyfforddi clybiau pysgota a grwpiau gwirfoddol i fonitro cyflwr bywydegol eu hafonydd – gwybodaeth a rennir wedyn gyda chyrff a all weithredu ar sail yr wybodaeth. Gyda chymorth y ddwy fenter hon gallwn helpu Natur i adennill tir a sicrhau bod yr amgylchedd yn parhau i'n cynnal ninnau hefyd.

‘Inspired by Nature’ competition joint winner

The European polecat: unsung species

Although the European polecat has featured in previous articles in this magazine, this attractive mammal, which has now spread out from its former refuge in Wales, needs to feature in the popular media and become a symbol for British conservation, argues ***OWEN BIDDER****.*

Photos: Michael D Smith

Young polecat

Never has such a fascinating and enigmatic species been overlooked by so many and for so long. The European polecat, *Mustela putorius*, is one of the true treasures of the British countryside; with its ‘bandit’ mask face and elusive nature, it is difficult to deny that it is an absorbing and exceptional species. Although my enthusiasm may be obvious, many people are unaware of this species’ plight.

The Mustelidae family (stoats, otters, weasels etc.) of which the polecat is a member, has traditionally received a bad press. To describe a person as a ‘weasel’ would be to call them vile or untrustworthy, although I’m sure the poor weasel would object to such a label. Despite anthropomorphism being a heinous crime in my field, the point is that, as a culture, we tend to cling to these traditional and derogatory descriptions of our native wildlife. Early references to polecats in English literature are negative, even slanderous and vilifying. Shakespeare used the species as a synonym for a prostitute or immoral person, as in the Merry Wives of Windsor; “Out of my door, you witch, you hag, you baggage, you polecat, you runyon!”

This attitude towards the polecat extended beyond the literature, as polecats were widely considered a nuisance around managed rabbit warrens, and control methods were used against them even in the 16th century. Despite this long term persecution, it wasn’t until the 1800s that the cataclysmic decline of the polecat really took place. Heavy persecution by gamekeepers in the 19th and early 20th century caused polecat populations to disappear in much of Britain. Langley & Yalden[1] argue that the polecat’s patterns of decline “match very closely the develop-

ing sporting estate, and gamekeeping profession". Additional pressures on polecat populations include non-target mortality caused by snare traps meant for rabbit control, and secondary rodenticide poisoning through the consumption of farmland rodents.

The result was that the polecat became confined to a stronghold in Wales of about 70km radius around Aberdovey. This limited stronghold meant that the polecat was relegated to obscurity, far from the public eye. Other persecuted species, such as the otter or badger, remained in a more uniform distribution, and received much greater exposure in the popular media than the uncertain polecat. In fact otters and badgers have gone on to become symbols for British conservation, being the subject of numerous news reports and even becoming characters in the popular children's series of books (and later a television series) *The Animals of Farthing Wood*. Again the unfortunate polecat was overlooked during these attempts to bring conservation into the nation's priorities.

This lack of exposure for the polecat is reflected in findings by Johnny Birks[2]. When he asked rural school children within the polecat's range to identify the animal shown in a series of photographs, only 3.8% of the children could identify the polecat whereas 83.7% identified the otter correctly. This evident disparity between awareness of other British carnivores and the polecat is worrying. It is not just among younger demographics that this is the case, but in adults too. Birks & Kitchener[3] write of conversations with members of a rural community in Herefordshire who were completely unaccustomed to the species. There were also reports that an outlandish folklore had developed, confirmed independently by two farmers in the area, in which the polecats were said to chew the ears of sheep as they lay sleeping in the fields! More fantastic were the accounts (again from two independent sources) of polecats leaping up and biting men on the back of the neck, causing paralysis and even death. This highlights the amount of misinformation that exists about the polecat.

Despite this lack of awareness and minimal conservation effort, polecats re-established themselves in much of Wales and the Midlands of England after the First World War. The reduced activity of the gamekeepers is said to be one of the main factors. William Taylor of the Forestry Commission wrote in 1952, "The species has undoubtedly profited by the reduced intensity of game preservation since 1914 and may be said to have taken a new lease of life."

However, the polecat has only limited legal protection under the Wildlife and Countryside Act 1981 & the Conservation (Natural Habitats, etc.) Regulations 1994, which makes it illegal to kill or intentionally trap polecats without a licence. If such a low level of awareness is maintained by the people living within the polecat's range, there is a risk that they may act in ignorance of the law, and if trapping were to persist it may result in local elimination of the polecat from its recently reclaimed range. As consumer pressure makes free range poultry farming, which is more vulnerable to polecat predation, more and more common, there is an increasing risk of renewed persecution of this species. Thus polecat awareness in the countryside becomes a relevant issue for conservation today.

The polecat's decline and recovery in Britain is analogous to that of the red kite, *Milvus milvus*, in that both species were once confined to strongholds within Wales, primarily through persecution by gamekeepers. But unlike the polecat, the red kite has gone on to become a flagship species for conservation in Britain, as it has undergone a healthy recovery in numbers since the reintroduction programme began in the late 1980s. Although effort has been made by statutory and volunteer organisations to bring the polecat to our attention, it is high time that polecats featured in the popular media, as many other charismatic species do. The Welsh people should be proud that their nation provided the only sanctuary for polecats in the entire British Isles for decades, and as such should embrace this wonderful, unsung species.

***Owen Bidder**, Swansea University*

Y ffwlbart: creadur ar y cyrion

Does yr un rhywogaeth mor ddiddorol ac enigmatig â'r ffwlbart wedi cael ei hanwybyddu gan gymaint o bobl am gymaint o amser. Yn wir, mae'r ffwlbart, *Mustela putorius*, yn un o drysorau pennaf cefn gwlad Prydain. Gyda'i wyneb 'lleidr' a'i natur swil, go brin y gellir gwadu ei fod yn greadur difyr a rhyfeddol. Er bod fy mrwdfrydedd i'n amlwg, mae'n siŵr, ychydig iawn aŵyr llawer o bobl am ei hynt a'i helynt.

Mae'r ffwlbart yn perthyn i deulu'r Mustelidae (sydd hefyd yn cynnwys carlymod, dyfrgwn a bronwennod ac ati). Yn draddodiadol, does yna fawr o ganmoliaeth wedi bod i'r teulu yma. Yn wir, y duedd yw dweud "hen ffwlbart o ddyn" wrth gyfeirio at rywun annymunol. Er bod anthropomorffaeth yn drosedd erchyll yn fy maes arbennig i, mae'n werth nodi ein bod, fel diwylliant, yn tueddu i lynu at ddisgrifiadau traddodiadol a dirmygus o'n creaduriaid cynhenid. Mewn llenyddiaeth Saesneg, darlun negyddol a geir o'r ffwlbart druan – darlun digon difrïol, yn wir. Cyfeiriodd Shakespeare at y creadur yma wrth sôn am butain neu berson anfoesol, fel yn y Merry Wives of Windsor: "Out of my door, you witch, you hag, you baggage, you polecat, you runyon!"

Ond fe ledaenodd yr agwedd yma tuag at y ffwlbart y tu hwnt i lenyddiaeth, oherwydd y farn gyffredin oedd bod ffwlbartod yn gwneud niwsans glân ohonynt eu hunain o amgylch tyllau cwningod ac ati, ac aethpwyd ati i geisio rheoli'u niferoedd, hyd yn oed yn yr unfed ganrif ar bymtheg. Er gwaetha'r erlid diddiwedd, mewn gwirionedd wnaeth niferoedd y ffwlbart ddim gostwng yn drychinebus o isel tan y bedwaredd ganrif ar bymtheg. Yn ystod y ganrif honno a dechrau'r ugeinfed ganrif, cafodd cymaint ohonynt eu lladd gan giperiaid nes peri i boblogaethau'r ffwlbart ddiflannu'n llwyr o'r rhan fwyaf o Brydain. Yn wir, mae Langley ac Yalden[1] yn dadlau bod dirywiad y ffwlbart yn y cyfnod yn mynd law yn llaw â galwedigaeth ciperiaid a'r arfer o hela. Elfennau eraill a gyfrannodd at ddirywiad y ffwlbart oedd trapiau a ddefnyddid ar gyfer rheoli cwningod, a hefyd cât rhai ffwlbartod eu gwenwyno gan wenwyn lladd llygod ar ffermydd.

Y canlyniad oedd cyfyngu ffwlbartod i gadarnle o amgylch Aberdyfi yng Nghymru – cadarnle oddeutu 70km o radiws. Golygai'r cadarnle cyfyngedig yma fod modd i ffwlbartod ddiflannu o olwg pawb. Parhaodd dosbarthiad rhywogaethau eraill a gât eu herlid – fel dyfrgwn neu foch daear – yn weddol unffurf, a chafodd y rhain lawer mwy o sylw yn y cyfryngau poblogaidd na'r hen ffwlbart druan. Yn wir, mae dyfrgwn a moch daear bellach yn symbol o gadwraeth ym Mhrydain ac yn destun nifer o adroddiadau yn y wasg. Maen nhw hyd yn oed wedi dod yn gymeriadau poblogaidd mewn llyfrau plant (ac wedyn ar y teledu) – *The Animals of Farthing Wood*, er enghraifft. Unwaith eto, cafodd y ffwlbart anffodus ei anwybyddu yn ystod yr ymdrech i ddod â chadwraeth i sylw'r genedl.

Mae'r diffyg sylw a gaiff y ffwlbart yn cael ei adlewyrchu yng nghasgliadau Johnny Birks[2]. Pan aeth ati i ofyn i blant ysgol a oedd yn byw o fewn dosbarthiad y ffwlbart enwi creaduriaid arbennig a ddangoswyd iddynt mewn cyfres o luniau, dim ond 3.8% o'r plant a lwyddodd i enwi'r ffwlbart, ond llwyddodd 83.7% i enwi'r dyfrgi. Mae'r gwahaniaeth amlwg yma rhwng ymwybyddiaeth plant o gigysyddion Prydain ar y naill law, a'r ffwlbart ar

y llaw arall, yn destun pryder. Ond nid ymhlith plant a phobl ifanc yn unig y mae hyn i'w weld, ond mewn oedolion hefyd. Cyfeiria Birks a Kitchener[3] at sgyrsiau a gawsant gydag aelodau'r gymuned wledig yn Swydd Henffordd, ac mae'n amlwg nad oedd y bobl dan sylw yn gyfarwydd o gwbl â'r rhywogaeth. Hefyd, mae rhai adroddiadau'n dweud bod traddodiad llên gwerin rhyfedd wedi datblygu – adroddiadau a gaiff eu cadarnhau gan ddau ffermwr yn yr ardal – lle honnir bod ffwlbartod yn cnoi clustiau defaid wrth iddynt orwedd ynghwsg yn y caeau! Ond ceir straeon mwy rhyfeddol fyth – unwaith eto o ddwy ffynhonnell annibynnol – lle dywedir bod ffwlbartod yn neidio ar bobl ac yn eu brathu ar gefn eu gyddfau, gan arwain at barlys a hyd yn oed at farwolaeth. Mae hyn yn tanlinellu cymaint o straeon camarweiniol sydd i'w cael am ffwlbartod.

Er gwaetha'r diffyg ymwybyddiaeth a'r diffygion o ran ceisio gwarchod y rhywogaeth, llwyddodd ffwlbartod i ailsefydlu yng Nghymru a Chanolbarth Lloegr ar ôl y Rhyfel Byd Cyntaf. Yn ôl pob tebyg, digwyddodd hyn yn bennaf gan nad oedd ciperiaid y cyfnod mor ddiwyd wrth eu gwaith. Ym marn William Taylor o'r Comisiwn Coedwigaeth, a ysgrifennai yn 1952, llwyddodd y rhywogaeth i elwa ar y ffaith na châi helfilod eu gwarchod i'r un graddau o 1914 ymlaen, a bod hyn wedi arwain at adfywiad ym mhoblogaeth y ffwlbart.

Fodd bynnag, nid yw Deddf Bywyd Gwyllt a Chefn Gwlad 1981 na Rheoliadau Cadwraeth (Cynefinoedd Naturiol etc) 1994 yn rhoi gwarchodaeth lawn i'r ffwlbart. Yr hyn a nodir yw ei bod yn anghyfreithlon lladd neu drapio ffwlbartod yn fwriadol heb drwydded. Os nad oes modd sicrhau bod y bobl sy'n byw o fewn dosbarthiad y ffwlbart yn dod yn fwy ymwybodol o'r creadur, y perygl yw y byddant yn gweithredu heb wybod beth yw'r gyfraith, a phe bai'r arfer o'u trapio'n parhau, fe allai ffwlbartod ddiflannu'n lleol o'r tir y maen nhw newydd ei adennill. Wrth i bwysau o du'r cyhoedd wneud ffermio dofednod o fewn y buarth yn arfer fwy cyffredin – sef rhywbeth a allai ei gwneud yn haws i'r ffwlbartod ddal yr ieir ac ati – y perygl yw y bydd pobl yn dechrau erlid y rhywogaeth unwaith eto. Felly, mae codi ymwybyddiaeth trigolion cefn gwlad ynghylch ffwlbartod yn berthnasol iawn i gadwraeth yn y byd sydd ohoni.

Mae llanw a thrai'r ffwlbart ym Mhrydain yn cyfateb i hynt y barcud, *Milvus milvus* – ers talwm, câi'r ddwy rywogaeth eu cyfyngu i gadarnleoedd yng Nghymru, yn bennaf gan eu bod wedi cael eu herlid gan giperiaid. Ond yn wahanol i'r ffwlbart, mae'r barcud bellach yn symbol o gadwraeth ym Mhrydain, ac mae'i niferoedd wedi cynyddu'n arw ers i'r rhywogaeth gael ei hailgyflwyno tua dechrau'r 1980au. Er bod sefydliadau statudol a mudiadau gwirfoddol wedi ymdrechu i dynnu ein sylw at y ffwlbart, mae'n hen bryd i'r creadur ymddangos yn y cyfryngau poblogaidd yn yr un modd â rhywogaethau hoffus eraill. Dylai trigolion Cymru ymhyfrydu yn y ffaith mai yn eu gwlad nhw y ceid yr unig hafan i ffwlbartod trwy Ynysoedd Prydain, a hynny am ddegawdau lawer. Yn wir, fe ddylen ni fel cenedl ymfalchïo yn y creadur hudolus hwn sy'n llechu ar gyrion ein cymdeithas.

***Owen Bidder**, Prifysgol Abertawe*

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Paul Dunn Glam HCP

Farming and wildlife - Taking stock

Wild bird corridor at Slade Farm, Glamorgan

Farming is the dominant influence over most of our land and its wildlife. Can the Government-supported agricultural sector produce food efficiently and maintain a wildlife-rich environment? At the start of this decade, there was optimism that new agri-environment schemes could help to achieve this. This optimism has faded, but the development of landscape-scale schemes could herald a brighter future, as ***JEFF DAVIES*** *explains.*

As we approach the end of the first decade of the 21st century, it is perhaps a good time to look back and take stock of the state of Welsh farmland wildlife.

Farming is by far the largest category of land use in Wales and has a profound influence on Welsh biodiversity. Historically, the area of land cleared of tree cover and thus available for farming has not changed significantly since 1000 AD, and early farming may well have been good for wildlife. But in the last 100 years much farming activity has been on balance detrimental, perhaps most evocatively leading to the extinction of the corncrake in Wales. More recently still, wildlife losses continue with increasing severity. How much progress has been made to halt declines in Welsh farmland wildlife over the last decade and what hope does the future hold for biodiversity?

At the turn of the millennium, there was a mood of optimism among both farmers and conservationists. The new National Assembly had been established, Tir Gofal had recently been launched as the new all-Wales

agri-environment scheme and the Welsh Assembly Government (WAG), in its strategy, *A Better Wales*, had pledged to stabilise the population of wild birds by 2010. In 2001, Carwyn Jones launched *Farming for the Future*, the new blueprint for Welsh farming. In the same year, the European Commission set a target to halt biodiversity declines by 2010, a target later adopted by WAG in the Environment Strategy for Wales.

A downward trend

Fast forward to the present day: birds and other farmland wildlife show no sign of recovery. There is scant hope that the 2010 biodiversity target will be met. Why has this happened and why is it still happening? The key reasons for the declines are highlighted by Michael Shrubb in his 2003 book *Birds, Scythes and Combines*, which eloquently describes how, in the post-war era, the countryside lost diversity vital for the survival of much farmland wildlife. Old grassland was replaced by new swards and traditional haymaking replaced by silage-making. Wet meadows and pastures were drained and improved and the patchwork characteristic of the intimate mix of arable and livestock farming all but vanished from large parts of Wales. The loss of diversity in the countryside, a diversity that farmland wildlife had been well adapted to for more than a century, was a hammer blow to biodiversity. By the 1970s, the effects were clear with marked declines in farmland birds being recorded.

With the introduction of agri-environment schemes from the late 1980s onwards, attempts were made to address some of these missing elements in Welsh farmland. With Tir Gofal in 2000, it was thought that we had the tool to solve the problem. Nearly ten years later over 3000 farms covering over 300,000ha of land have entered Tir Gofal, yet there is no clear evidence of recovery in any of the species that are listed as being of principal importance for the conservation of biological diversity in Wales[1]. The trend for farmland birds is still downwards and the index for widespread breeding birds of farmed habitats is now at its lowest point since the survey began in 1994.

In 2007 WAG commissioned a study of agri-environment schemes, which analysed the likely ability of the current schemes, including Tir Gofal, to deliver for priority species[2]. The study found that, for Tir Gofal, although there was potential to deliver all the key ecological requirements for a number of species, in many cases either the up-take was not enough to make a difference or prescriptions were being applied in the wrong places. One of the fundamental problems of trying to tackle species declines today is that many species which were once widespread and numerous, such as yellowhammer and tree sparrow, have not only declined in number, they are far more patchily distributed than they were in the past. This in turn makes it imperative that any agri-environment prescriptions aimed at those species are applied in the places where they live. The next step is to ensure that those prescriptions are also taken up at a large enough scale to make a difference at a population level. Some species targeting in this way has recently been introduced into Tir Gofal and it is

Yellowhammer

©Chris Gomersall RSPB Images

hoped that the current monitoring programme will show whether it is effective. There is evidence from elsewhere that targeted agri-environment action can bring about population recovery[3].

Species of Principal Biodiversity Importance covered by the 2008 study.

Birds: *black grouse, grey partridge, lapwing, curlew, turtle dove, chough, tree sparrow, yellowhammer, corn bunting.*
Plants: *annual knawel, shepherd's needle, weasel's snout, corn marigold, pillwort, three-lobed water crowfoot, marsh clubmoss, chamomile, juniper, pink waxcap.*
Butterflies: *marsh fritillary, brown hairstreak, grayling, small pearl-bordered fritillary, small heath, large heath.*
Mammals: *lesser horseshoe bat, noctule bat, common pipistrelle, soprano pipistrelle, serotine bat, brown hare, water vole.*

Glastir – a more effective mechanism?

The greater challenge is to apply these schemes effectively and in sufficient quantity to make a difference. The problem of applying agri-environment solutions at a sufficiently large scale is essentially one of resources. Agri-environment schemes are funded through the Rural Development Plan (RDP), the so-called Second Pillar of the Common Agricultural Policy (CAP). The RDP funding is finite and the budget available for Tir Gofal in the current RDP period is severely constrained by other demands on the budget, which also funds Tir Cynnal (the entry-level scheme), Tir Mynydd (the Less Favoured Area scheme) and a number of other schemes such as the Organic Farming Scheme, Better Woodlands for Wales and a Catchment Sensitive Farming Scheme.

WAG recently reviewed all the land management schemes operated under the RDP in the light of current priorities, including climate change, biodiversity and water. Elin Jones, the Welsh Assembly Government's Minister for Rural Affairs announced in May 2009 that a new scheme, named Glastir, would replace all the existing schemes from 2012. Glastir will have two components: a basic tier, which will be available across the whole of Wales and a higher tier, which will be spatially targeted on priority areas. The scheme as a whole is meant to deliver a set of

Tree sparrows

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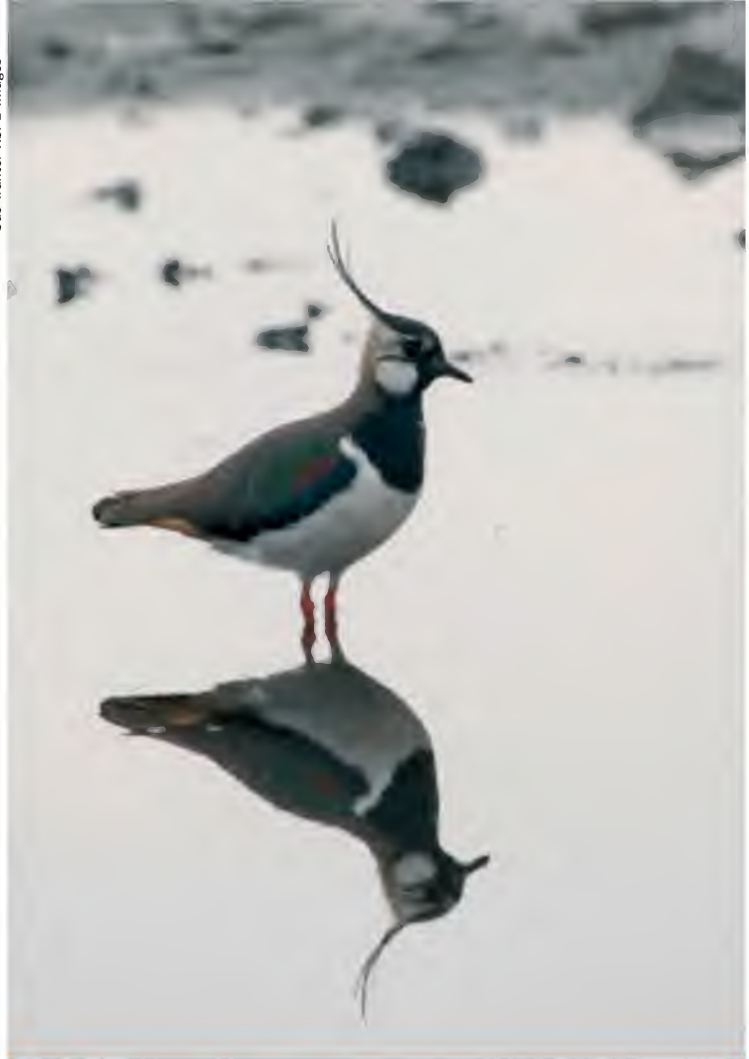

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Lapwing

measurable priority outcomes at both the individual farm and landscape scales under the headings of carbon management, water quality and quantity management, biodiversity management, landscape and heritage management and access.

To be effective, the Glastir Basic scheme will need to be carefully designed so that all the options available will clearly deliver on at least one, and preferably more than one, of the priority outcomes. For biodiversity, the scheme must aim to deliver for priority species. There should be enough flexibility in the scheme to allow focused action for particular species or species assemblages to take place. This could be done effectively for suites of species associated with particular habitat types, such as arable land or marshy grassland, by grouping prescriptions in packages. For example, a prescription package aimed at marshy grassland could provide the essential conditions for species including marsh fritillary, small pearl-bordered fritillary, Welsh marsh orchid, marsh fragrant orchid, tubular water dropwort, curlew, lapwing, brown hare, harvest mouse, water vole and all herpetiles. It will be a challenge to ensure that the Basic tier delivers for farmland wildlife but it is essential that it does work, as it is the main hope for the future of many species in the wider countryside.

The Glastir Higher Tier will aim to address the priority issues such as biodiversity, climate change, water management, landscape, heritage and access within defined spatial boundaries. The details of this part of the scheme will be developed in the coming months. It is envisaged that the Higher Tier will be aimed at more complex management, possibly on a water catchment basis with peatland and upland vegetation management as key components.

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Chough

Glastir - llygedyn o obaith?

Mae dyfodiad cynllun Glastir yn cynnig gobaith newydd i fywyd gwyllt, gyda'i bwyslais ar amcanion amgylcheddol, yn cynnwys taclo cyflwr truenus rhai o'n rhywogaethau pwysig. Ers 2000 cafodd 300,000 ha o dir eu cynnwys yng nghynllun Tir Gofal, ond nid oes tystiolaeth glir bod rhywogaethau pwysig yn adfer o ganlyniad i hyn. Un o'r problemau yw bod rhywogaethau a fu unwaith yn gyffredin, fel y bras melyn, nid yn unig wedi dirywio o ran nifer ond hefyd wedi crebachu'n boblogaethau gwasgaredig. Rhaid i reolaeth, felly, ddigwydd yn y mannau cywir ac ar raddfa ddigon eang i wneud gwahaniaeth. Mae'n amlwg bellach bod angen targedu gofalus os am helpu bywyd gwyllt. Bwriedir i Glastir ddwyn ffrwyth, ar lefel fferm unigol a thirlun cyfan, o safbwynt nifer o flaenoriaethau – rheoli carbon ac ansawdd a chyfanswm dŵr, rheoli bioamrywiaeth, tirlun a threftadaeth, a rheoli mynediad. Bydd cynlluniau ar y lefel sylfaenol yn gorfod gwireddu o leiaf un o'r blaenoriaethau a dylid ystyried sut i becynnu canllawiau er mwyn diogelu llu o rywogaethau sy'n gysylltiedig â chynefinoedd arbennig fel tir âr neu laswelltir gwlyb.

Bydd haen uchaf cynllun Glastir yn delio â'r blaenoriaethau ar lefel gofodol ac yn taclo materion mwy cymhleth, efallai ar sail dalgylchoedd dŵr. Bydd gweithio ar draws ffiniau ffermydd unigol yn her newydd i'r cynllun hwn.

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Ynys Hir RSPB Reserve and Dyfi Estuary

Working on a landscape scale, across individual farm boundaries and on common land, will be a feature of the scheme. Priority species and habitats will be a key focus. The announcement of Glastir is a significant step forward for farmland wildlife as it realigns the entire budget available for land-management schemes to focus on agri-environment with a clear set of objectives including dealing with declines in priority species. The popularity of Tir Gofal has shown that Welsh farmers are keen to play their part. It is imperative that Glastir provides them with the tools to help bring Welsh farm wildlife back from the brink. The next decade could be the last chance to do so for many iconic species such as lapwing and curlew.

***Jeff Davies** is RSPB Wales' Agriculture and Rural Policy Officer and has a particular interest in farmland birds.*

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Mammal monitoring - the water shrew and friends

All pictures: Rob Parry

Baby water shrews in the nest

Mammal surveys usually involve trapping, and observations of the natural behaviour of elusive small mammals like the water shrew are rare. The methods used in one study overcame this limitation and produced some fascinating insights, as ***ROB PARRY*** *reports.*

Observing the behaviour of mammals in their natural habitat remains one of the greatest challenges in mammal conservation. When attempting to study a mammal, all too often we have to rely on identifying droppings and footprints in the field, considering ourselves lucky if we are able to get a fleeting glimpse of the species. The elusiveness of mammals is what makes studying them so important to conservation, and ultimately so rewarding. This elusiveness is not just confined to our large species such as otter *Lutra lutra* and pine marten *Martes martes*, but applies equally to some of our smaller species, such as mice, shrews and voles.

Water Shrew

Many small mammal monitoring techniques involve intrusive trapping methods, which apart from being costly and time consuming, can inhibit observations on the behaviour of species in their natural habitats. During 2008 I used an alternative monitoring method which revealed new insights into many of our small mammal species, and how they react to environmental changes and to each other.

The study site. INSET: Water shrew nest

The study

The study took place in the County Borough of Neath Port Talbot at a 7ha site comprised predominantly of reedbed and marshy grassland, all interconnected by a network of drainage ditches and channels. Part of the site has been identified as a potential development area and as a result required an ecological survey.

Originally, reptiles were the main concern prior to the surveys, and little regard was shown toward small mammals. The quality of the habitat, however, suggested that the site was capable of supporting healthy populations of many of our small mammal species and therefore something had to be done.

Reptile surveys use artificial refugia in the form of corrugated roofing sheets, which provide ideal basking opportunities for snakes and lizards, and small mammals are also attracted to the sheets as they provide a safe, warm and dry shelter from aerial and larger terrestrial predators. Until now, no concerted efforts have been made to record small mammals and their behaviour under the refugia. My study provided an opportunity to undertake a full small mammal survey using the alternative methodology of artificial refugia.

In total 203 1m^2 corrugated sheets were placed throughout the study site, encompassing as many different habitats as possible. The refugia were placed on top of uncut vegetation and allowed to settle in situ for a week. Once in place, the sheets were monitored for a period of 66 days from August to October 2008. All mammal species found under the sheets were recorded along with any observed behaviour. In order to simplify the survey, field signs were not used as a determiner, only actual sightings of the species.

The water shrew

Of greatest concern prior to the study was the presence and distribution of our three species of shrew, given their increased legal protection under Schedule 6 of the Wildlife and Countryside Act 1981. In particular, the various wetland habitats contained within the site offered optimal conditions for water shrew *Neomys fodiens*.

Water shrews have always held a strong place in my admiration, not least due to their elusiveness, but also the frantic and rather ferocious way they live their lives. Water shrews have a short lifespan, rarely surviving over 12 months, but during this time can produce 2-3 litters of 5-7 young. They feed mainly on terrestrial and freshwater invertebrates but can also take prey much larger than themselves such as frogs, newts and small fish, which they immobilise with the aid of venom, affecting the nervous and respiratory systems of their prey.

The study methodology made possible certain insights into the water shrew's ecology that are rarely observed in the field.

Results and observations

In total 3,529 individual records of ten different mammal species were made during the 66 day study, the majority of which consisted of bank vole (1,946), followed by field vole (947), with water shrew (368) being the third most recorded species.

Other species recorded under the corrugated sheets

Mammal Species	Scientific Name	Total Number of Records	Percentage of total Records	Total Number of Occupied Refugia (n=203)
Bank Vole	*Myodes glareolus*	1946	55.1	181
Field Vole	*Microtus agrestis*	947	26.8	148
Water Shrew	*Neomys fodiens*	368	10.4	95
Common Shrew	*Sorex araneus*	142	4.0	52
Pygmy Shrew	*Sorex minutus*	73	2.1	40
Wood Mouse	*Apodemus sylvaticus*	37	1.0	6
Brown Rat	*Rattus norvegicus*	11	0.3	6
Mole	*Talpa europaea*	5	0.1	5
Weasel	*Mustela nivalis*	2	0.1	2
American Mink	*Mustela vison*	2	0.1	1
Total	**3529**			

(credit)

Table 1: Total number and occupation of mammal species recorded under artificial refugia.

included mole, common and pygmy shrew, as well as wood mouse and brown rat.

All records with the exception of Mustelids (weasel and mink) were obtained from actual sightings of the species. Both weasel and American mink presence was determined by scats, which were found under the refugia.

There was an average of 53.5 mammal sightings made on each survey, and if additional field signs had been recorded, such as burrows, runways and droppings, the average number of mammal records would be much higher, especially for species of shrew. Observations from several of the refugia revealed high concentrations of shrew droppings, whether or not any species of shrew was sighted under the sheets.

The effects of a flood

Water shrews were recorded on all but two days of the study, with a maximum of 17 records on 13th September 2008. This high number can be partly attributed to a family of water shrews, consisting of one adult female and 6 young, first recorded on the 6th September and last seen on the 28th of the same month.

The most surprising thing about the family group was that it was recorded during a time when most of the surrounding habitat was underwater due to unseasonably high rainfall. During this time many other small mammal nests and their young were lost as a consequence of the floods.

In contrast, records for water shrew increased during this time, possibly due to the greater movement of water shrews during this wet period. Although fewer records for water shrews were made from the flooded reedbed and marshy grassland habitats, more records were made in the raised drier areas of the study site. This suggests that the water shrew population temporarily migrated to safer ground, possibly owing to their greater mobility in water and their nomadic lifestyle.

One species that did not fare so well as the water shrew during the floods was the field vole, whose observed frequency declined throughout September 2008, visibly evident by the number of drowned young. Interestingly, bank vole records after the flood increased, whereas field vole records continued to decline.

Nests and nest sharing

Of all the shrew nests found during the study only one water shrew nest proved to be occupied by young. The nest was relatively small and consisted of dried grass and leaves, resembling a typical sleeping

nest as opposed to a breeding one. Indeed the small structure was barely able to contain the mass of young shrews, which at first appeared to be nothing more than a dark grey shimmer. On closer examination I observed that the adult female water shrew, which could not be seen at first, lay flat on her back whilst her six young battled for suckling rights on top of her.

Typical, larger shrew nests were also identified throughout the survey. These were approximately the size of a dinner plate, dome-shaped and consisting of grass and moss. These nests however were constructed by common shrew, one of which was first recorded occupying a nest just five days into the survey. The nest was sporadically occupied by common shrew for approximately 40 days. Although no young were observed, the size of the nest suggested that it was used for rearing young. On its last day of occupation by common shrew, a decapitated head of a young shrew, presumably a common shrew, was found on top of the nest chamber. Surprisingly the day after finding the decapitated head, the same nest was occupied by a water shrew which had moved into the nest and remained there for the remainder of the survey. The water shrew may have caused the death of the infant common shrew, and similar observations of nest takeovers were made during the survey.

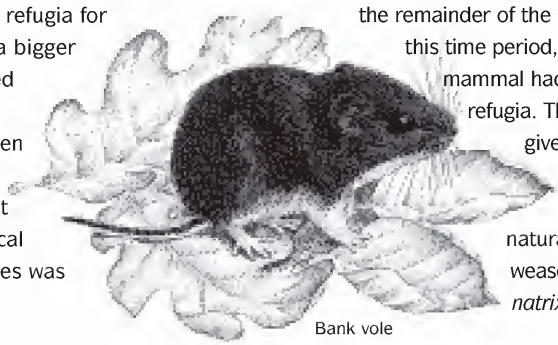
On several occasions water shrews were observed leaving nests, previously identified as being occupied by both common and pygmy shrew. In all instances it is uncertain whether physical force was used to evict previous occupants or whether new occupation was a result of a natural abandonment by the previous owners. What is known is that by recording individual species under refugia for each day of the survey, a bigger picture can be assembled and, given the relatively short time period between two different occupants, the observations suggest that some form of physical force by the larger species was likely.

Field vole

However not all encounters between species were aggressive. The most surprising observation I made was of a bank vole and a water shrew sheltering under the same refugia and frequently swapping nests, and on one occasion sharing the same nest. Such instances of different species cohabiting the same refugia were fairly common, especially among voles and shrews, but less common between different shrew species.

Other observations

Both bank and field vole nests were commonly observed, as was the species itself, being recorded under nearly all 203 refugia. Their desire to take up residency under refugia was quite overwhelming, quickly establishing new nests where old ones, along with their previous occupants, had been destroyed by predators. It was frequently observed that new voles would build nests in close proximity to the carcass of the previous resident. The only contrast to this was the apparent avoidance to American mink. Only one mink scat was found under a refuge, 26 days into the study. Prior to the scat, the refuge had been occupied by both brown rat and bank vole and it was clear from the remains of bank voles that either brown rat or mink had been responsible for their death. The remains of the bank vole family and scat were allowed to remain in situ for the remainder of the survey period (40 days). During this time period, no other single individual mammal had taken up residency under the refugia. This was all the more surprising given that bank voles would quite commonly occupy refugia previously inhabited by natural predators such as brown rat, weasel and grass snake *Natrix natrix*.



Bank vole

Advantages and application of methodology

This alternative methodology has many advantages over traditional small mammal surveying techniques. Above all else it offers relatively low levels of disturbance to the species, especially when compared to standard small mammal trapping. The methodology does not require daily visits to ensure animal welfare, indeed, if a species is known to be utilising a refugia for breeding, a conscious decision can be made to avoid inspection for several days.

As this alternative methodology is less bound by time restrictions and does not rely on bait and bedding, the overall cost of a project can be much lower, especially when considering that each 1m² refuge costs approximately £5.00 and is readily available from hardware stores.

The refugia also provide a means to survey for a multitude of small mammal species at once and allow observations of their behaviour to be made in their natural habitats, an opportunity that seldom presents itself when studying mammals.

There are of course disadvantages to the methodology. No biometric data, such as size and weight, can be collected and it relies heavily on the surveyor's identification skills and experience. Therefore the artificial refugia methodology is best suited to monitoring programmes, mammal atlases and volunteer training days, which would undoubtedly benefit from actually seeing the species. Perhaps most importantly of all, the methodology should be applied to proposed planning applications and developments, which all too often overlook our small mammal species.

Robert Jones Parry *is the Wildlife and Wetland Advisory Officer for the Wildlife Trust of South and West Wales.*

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Arbrofi â dull arolwg newydd

Mae'n bwysig astudio mamaliaid yn eu cynefin naturiol os am eu gwarchod, er mor anodd yw gwneud hyn. Gall dulliau arsylwi traddodiadol ymyrryd ag ymddygiad yr anifeiliaid ac felly yn 2008 defnyddiwyd dull gwahanol o fonitro ar safle datblygu yn ardal Nedd Port Talbot.

Ymlusgiaid oedd y consyrn pennaf i gychwyn, ond mae'r llenni metal tonnog a ddefnyddir ar gyfer arolygon ymlusgiaid yn denu mamaliaid bychain hefyd am eu bod yn cynnig lloches diogel a chlyd.

Dros gyfnod o 66 diwrnod cofnodwyd presenoldeb ac ymddygiad mamaliaid bychain dan 203 o ddarnau metal tonnog. Canfuwyd 10 math gwahanol o famal ac roedd y dull arolwg hwn yn cynnig cyfle arbennig i ddeall mwy am ecoleg llyg dŵr. Llyg dŵr oedd y trydydd mamal mwyaf cyffredin ar ôl y llygoden bengron goch a llygoden bengron y gwair. Cofnodwyd y rhywogaeth ar bob un namyn dau o'r 66 diwrnod, hyd yn oed mewn cyfnod o orlif pan gollwyd nythod a babanod mamaliaid eraill, fel llygoden bengron y gwair. Awgryma hyn bod llyg dŵr yn gallu mudo dros dro i fannau sychach a mwy diogel.

Gwelwyd bod llyg dŵr yn meddiannu nythod rhywogaethau llyg eraill a'u bod hefyd yn llochesu gyda llygod pengrwn coch ac yn cyfnewid nythod â nhw. Annhebygol oedd gweld rhywogaethau llyg yn rhannu'r un lloches. Roedd llygod pengrwn coch a llygod pengrwn y gwair yn fodlon sefydlu nythod newydd lle roedd ysglyfaethwyr wedi dinistrio rhai blaenorol – ond nid lle bu minc yn gyfrifol am yr ysglyfaethu. Nid yw'r dull arolwg hwn yn cynhyrchu data biometrig ac mae'n ddibynnol iawn ar brofiad, ond mae'n rhad, yn llai tebygol o darfu ac yn rhoi cyfle i astudio sawl math o famal ar yr un pryd yn eu cynefin naturiol. Ac felly'n ddull ddefnyddiol iawn mewn achosion datblygu.

New Parasitic Lichens in Wales

Lichens are a close association of a fungus and an alga. Whether this is seen as an equal partnership, or enslavement of the alga by the fungus, it is a successful way of life, and lichen-forming fungi have arisen from free-living fungi many times during evolution.

Two recent additions to the Welsh lichen list are species of *Placopyrenium*. These often attack and kill other lichens, possibly to steal the alga that they need, or simply to find space on a crowded rock.

Placopyrenium canellum has been known in Wales for a long time. It was described by the Finnish lichenologist William Nylander, from specimens sent by the Reverend JE Griffith, who collected them on Great Ormes Head in the 1880s. This name was largely ignored and forgotten, but is now reinstated. *P. canellum* attacks the white limestone-lichen *Aspicilia calcarea*, forming dark spreading spots (Fig. 1). I discovered a very similar thing in 1998 beside the Afon Llafar above Bethesda, a stream which is home to several rare lichens. Instead of growing on sunny limestone, however, it was attacking a different species of *Aspicilia*, on rocks beside the water. Fig. 2 shows the brown *Placopyrenium* on the right, engulfing a patch of grey *Aspicilia* on its left. Subsequently, I saw more collections from France, Scotland, and Iceland.

Later, yet another *Placopyrenium* turned up, beside the River Wye and other streams in Mid Wales, but this one attacked a brown lichen called *Staurothele*.

DNA sequencing was used to see if all these specimens really belonged to distinct species, or were just forms of the same one. It is relatively simple to extract and purify DNA from a fresh lichen, and to send it to a commercial laboratory for sequencing. A short stretch of DNA called the ITS region was examined. The sequence obtained is in the form of a string of several hundred letters (combinations of the four bases of the DNA alphabet). The strings are, in effect, put side by side and compared. It is like comparing the different surviving copies of an historical manuscript, noting spelling mistakes, deletions, and rearrangements of certain words. The differences are analyzed to suggest how the specimens might be related in an evolutionary tree.

The Afon Llafar specimens proved to be identical to specimens collected in Iceland and Finland, and clustered together on a different branch from related species. After searching old books and journals, and examining specimens in lichen collections throughout Europe, I concluded that the species had never been described before. It was described early in 2009 as the new species *Placopyrenium formosum*. It was decided to use an Icelandic specimen as the 'type' of the new species. The type is the one specimen that the name is permanently attached to, in case there is ever any doubt. The Icelandic specimen was large enough to divide into two, one part remaining in Amgueddfa Cymru-National Museum Wales, and the other part going to the Natural History Museum in Akureyri in Iceland.

The Mid Wales specimens clustered at the end of another 'twig' of the evolutionary tree. Study of specimens in lichen collections in Scandinavia showed that they belonged to *P. cinereoatratum*, first described from Sweden.

Field-lichenologists need not worry. It is not necessary to use DNA to identify these species, as they differ subtly in form, but sequencing is a powerful way to be confident that these species really are distinct, and that populations in different countries belong to the same species.

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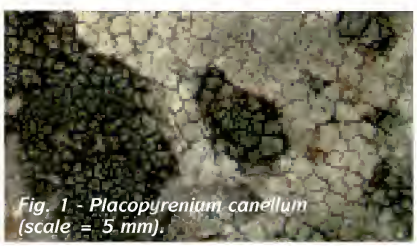


Fig. 1 - Placopyrenium canellum (scale = 5 mm).

Fig. 2 - Placopyrenium formosum (scale = 1 mm).

Alan Orange is Research Curator of Lichens at Amgueddfa Cymru - National Museum Wales. He is currently working on the taxonomy of the lichen family Verrucariaceae in Wales and other parts of Europe.

New Wales Woodland Strategy Launched

On Friday 27 March, at Carreg Cennen Castle near Llandeilo, Elin Jones, the Welsh Assembly Government's minister for Rural Affairs, launched *Woodlands for Wales* – the revised strategy for woodlands and trees. The strategy was first launched in 2001, and set out the 50 year plan for woodlands and trees in Wales. This has been revised to take account of the huge challenge of climate change, and its aims include increasing Wales' woodland cover, bringing more woodlands into management, and increasing the diversity of non-native woodlands. This increased diversity will help woodlands become resilient and adapt to a changing climate, and ease its effects.

Woodlands and trees can help Wales contribute towards its ambitious targets of a year-on-year 3% reduction in greenhouse gas emissions from 2011:

- Through **sequestration** – growing trees lock up carbon in their roots and branches, and even more carbon becomes stored in the soil itself
- Through **substitution** – woodfuel can act as a carbon-neutral energy source replacing fossil fuels, so long as new planting replaces what has been cut. Also, timber used in construction and manufacturing can not only replace energy intensive materials like concrete and steel, but can also lock up its carbon for many years as beams in buildings, for example.

The strategy recognises that woodlands not only produce products such as timber, they also provide a range of services which cannot be sold on the open market but are nevertheless are of great importance. These services include providing places for recreation, protecting water and soil resources, alleviating flooding and locking up carbon. It is the Assembly's aim to develop systems of payments for these 'ecosystem services'.

Bringing more woodlands into active management will increase the provision of ecosystem services and fight against climate change. However, management needs to be sensitive: for example, gradual thinning of plantations reduces the high environmental impact associated with clear felling, when all trees are removed from a site at once. Greater use of thinning is seen as a key means of providing more ecosystem services.

Improving the condition and management of woodlands includes looking after irreplaceable ancient woodlands and other species-rich habitats. Much of the unmanaged woodland in Wales is found on farms. Woodland owners who bring them back into management will see increased yields of wood for use on the farm, including wood for fuel. The environmental condition of these woodlands may improve, promising wider benefits through other services they provide. This is part of a more integrated approach to land management which would bring benefits to wildlife and ensure many rare woodland species are protected.

Increasing Wales's woodland cover – including in our towns and cities – can provide opportunities for healthy recreation. Wales is one of the least wooded countries in Europe, with only 14% cover. This links in with the Assembly's *One Wales* document which is committed to the creation of a Welsh National Forest of native trees to act as a carbon sink. This process is already under way with the inception of the Assembly's Plant! project which involves planting a tree for all babies and adopted children in Wales.

Woodlands for Wales can be downloaded from the Forestry Commission Wales website at: **www.forestry.gov.uk/website/fchomepages.nsf/hp/Wales**

It is also available as a hard copy and in other forms (e.g. large print) by contacting Forestry Commission Wales by phone **0845 604 0845**, fax: **01970 625282** or email **fcwales@forestry.gsi.gov.uk**

Barbara Spence

Green **Bookshelf** • **Silff Lyfrau** Amgylcheddol

THE ETHICS OF WHAT WE EAT
Peter Singer & Jim Mason
Rodale, 2006, 328 pages
Paperback £9.99

IN DEFENCE OF FOOD
Michael Pollen
Allen Lane, 2008, 242 pages
Paperback £8.99

THE FACE ON YOUR PLATE
Jeffrey Masson
W W Norton, 2009, 288 pages
Harback £17.99

The growth of a politics of food has led to a minor landslide of books such as the three which I am reviewing here. This trio are all by American authors, and, you could argue, their dialectics on food amounts to no more than a diversion for a neurotic populace with plenty to eat but nothing serious to worry about.

The Ethics of What We Eat provides some unsettling context to the choices we make when we purchase food. With chapter titles like 'The Hidden Cost of Cheap Chicken' and 'Meat and Milk Factories', indiscriminate carnivores are in for a bumpy ride. The authors give all of us food for thought; for example we are told that finding any seafood that is environmentally sustainable is not easy, and they provide the evidence to back this up.

In Defence of Food is a sobering insight into how bad our Western diets are, and how important what we eat is to our overall health. It pulls no punches when it comes to exposing a food industry which pushes its salt, sugar and fat-laden

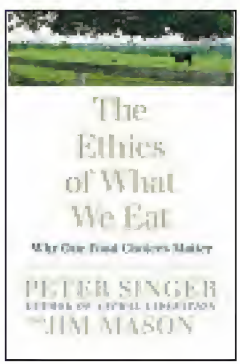
Hilary Kehoe

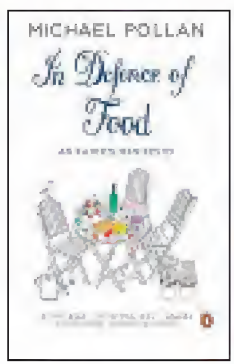
compounds on a helpless public without conscience. Happily, this lucid account of where the Western diet went wrong is also full of common sense answers to dietary dilemmas, advocating a more natural diet based mainly on plants. Pollan does not believe there is a good health reason to exclude meat from the diet, although he concedes that there may be ethical and environmental reasons to do so, citing the brutality of industrial meat production as one of them.

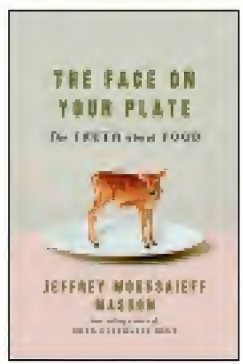
The Face on your Plate takes this argument much further. We are asked to equate ourselves with animals reared for meat. Would we have children, if we had to 'sacrifice' them to be eaten? Masson's emotive tract tells us that veganism is an expression of the ability to love, our empathy with animals preventing us from participating in their enslavement in a relationship based on cruelty and deceit. There is no room for the reader to have his or her own thoughts, no uncertainty, thoughtfulness or balance. I also found the style irritatingly pleased with itself. Pity the younger urban American reader at whom this book is presumably aimed.

As these books argue, the Western diet has been corrupted, and the food we consume affects our health, the environment and has an ethical dimension. This includes issues like our excessive consumption of meat, and the economic pressures on farmers to produce this at the lowest possible cost. For those interested in ethics, I would recommend the first title. I will be keeping the second on my shelves, as an informative and well-written account of where we are and where we need to get to with food. The third I would recommend to the converted vegan who wants to fuel his own self-righteousness.

James Robertson







Islands round-up

Ramsey Island (RSPB)
Rabbit numbers are still low after disease outbreaks. Sheep grazing has been increased to maintain short turf, for choughs to feed. At least five pairs of lapwings bred. Wardens Greg and Lisa Morgan over-winter on the island. On 17th Jan 2009, Lisa reported on her blog (see website below):

The island and its human inhabitants have been invigorated by the calls of golden plover, lapwing and curlew and it has been almost impossible to take a walk without flushing a snipe, jack snipe or woodcock from the fallen bracken and marshy places. Winter thrushes have also made a welcome return this year. After only a single record of fieldfare last winter, numbers have been good with mixed flocks of redwing, fieldfare and song thrush roaming the island in the last few weeks.

Visiting Ramsey: day trips to end October. See **www.rspb.org.uk** or ring Thousand Island Ferries **01437 721686**.

2008 News from Skomer and Skokholm
Weather: in early March storm-force winds made the tankers in St Bride's Bay look more like little toy boats. Streams that normally dry out in summer flowed with some force throughout the season. Visitor numbers to Skomer were down in June and August because of the persistent wet weather. In October gale-force winds and rain lashed the islands on many days.

Skomer wildlife
Grey seals: a total of 141 pups were born on Skomer, including three in spring. There is a slow decline in the number of pups born on Skomer and a corresponding increase in the number of pups being born on the mainland. The island and mainland seals are not distinct populations so it makes more sense to look at the two together, and the total has remained stable over the last 15 years.

Mike Alexander

Seal cow with pup onshore

Rabbits: seem to be making a slow recovery from the myxomatosis outbreak in 2007. This follows the crash in numbers between 1995 and 1997 due to outbreaks of Rabbit Viral Haemorrhagic Disease.

Seabirds: the last issue of *Natur Cymru* had detailed articles on the long-running guillemot studies (Tim Birkhead) and tracking the island's Manx shearwater at sea (Chris Perrins). In 2008, *guillemot* numbers were around normal, but adult survival fell to 76% (compared to the expected 85-90%), and breeding success was low at 0.59. Great black-backs were seen to take eggs and chicks. The breeding success of razorbills was the lowest recorded at 0.17. The maximum count of *puffins* was normal, as was the breeding success (0.63 per occupied burrow). *Kittiwakes* increased to 2,282 pairs, but breeding success at 0.55 per nest was still below average. There was an almost total breeding failure of the large *lesser black-backed gull* colony. Few carcasses were seen, so it seems likely that breeding failed at the egg or small chick stage. Very wet conditions and long, lush vegetation within the colonies may have led to small chicks becoming chilled.

Other notable breeding birds (with number of pairs in brackets) included *peregrine* (4), *curlew* (11), *skylark* (33) and *reed bunting* (8).

Skokholm
2008 was the first year of the Restoration Project, and it is hoped that building work will begin in 2009. The layout and appearance of the current accommodation will be unchanged, but all will be upgraded, with a slate roof on the central block. There was no resident warden and Skomer staff undertook conservation work and managed day trips. Seven of the latter were planned but only three took place.

Visiting Skomer (and Skokholm): both islands are managed by the Wildlife Trust for South and West Wales. See **www.welshwildlife.org** or ring **01239 621600**.

Collated by Geoff Gibbs

Mammal news

The Anglesey Red Squirrel Project reports that since the summer of 2008 red squirrels have been regularly visiting gardens in the coastal woodlands from Menai Bridge to Beaumaris. The number of animals present is relatively small, with 20-25 adults, but favourable breeding and recruitment rates could lead to the development of a significant broadleaved population over the next few years. Some of the animals can be seen online via a live-feed webcam www.redsquirrels.info/squirrelcam.html which was funded by Anglesey County Council.

Support for our reds is also being given by the Mid-Wales Red Squirrel Partnership, which has been awarded £15,000 by The People's Trust for Endangered Species for continuing red squirrel surveys and education & awareness-raising events. A report is also due out on habitat suitability for reds within some of the mid-Wales forests. Contact Bev Lewis at Brecknock Wildlife Trust for further information.

It is interesting to hear of an example of natural predation of greys. Griff Williams reports a stoat attacking a grey squirrel while walking in a wood at Dolwyddelan in late February. There was a vicious fight with both animals rolling about in the grass, and the poor squirrel was screaming with terror. Eventually it managed to break free and make good its escape. A once in a lifetime experience and Griff had no camera!

Kate Williamson, from Snowdonia National Park Authority, was on Harlech dunes Longworth trapping for The Mammal Society pilot harvest mouse study in January, and was surprised to catch a water shrew. There was no water for some way, bar a few ephemeral pools after heavy rain, which shows it's worth looking out for these smart little mammals even if there is no water nearby.

In mid-December, a common seal was spotted in the estuary at Aberogwen, eating a salmon. Stephen Westcott says they are seen in small numbers fairly regularly off east Anglesey, but this sighting was unusual. There was speculation as to whether it might be one that was released at Conwy after being rescued and rehabilitated.

Last September, someone called into the North Wales Wildlife Trust and reported seeing an otter on Bangor High Street at 5am. The description of the animal sounded right. There have been increasing numbers of sightings along the Menai Straits as well as nearby rivers such as the Ogwen and Cegin in recent years, so this is perhaps not such an unlikely occurrence.

Unfortunately the lucky otter-spotter didn't leave their name so we have no way of getting more information, but it certainly enlivens the imagination to picture a deserted city centre in the early hours, with an otter making its way along past the shop windows. If you hear of any urban (or rural) otter appearances, please let your local Wildlife Trust / mammal recorder know.

And finally, has anyone seen a white stoat or ermine recently? Ben Stammers recalls seeing a partially white one about three years ago on Anglesey, but is not sure whether it was just albinism rather than the seasonal change of pelage.

Frances Cattanach is Director of North Wales Wildlife Trust

Welsh conservation management conference: People, places – shaping the landscapes of Wales

There is a generosity of spirit abroad in what you might loosely call the 'heritage sector', judging by those from disparate backgrounds who gathered at the splendid gothic folly of Bodelwyddan Castle hotel. Mostly professionals, but with a valuable mix of students, the 180-odd delegates seemed comfortable with broad definitions of nature, culture and landscape; straightjackets and territorial behaviour were not in evidence. So no one questioned why an exploration of the way we have been shaped culturally by the landscape of Wales, and in turn have shaped that landscape, should include reference to, for example, art, music and poetry.

Speakers on the first day included Gwilym Hughes, Chief Inspector of Ancient Monuments, Cadw, who described landscape as a window on the past, and a unifying and defining force which was subject to change. Toby Driver described new aerial reconnaissance techniques which had uncovered hidden ancient archaeological features, and which might also be useful for ecological monitoring.

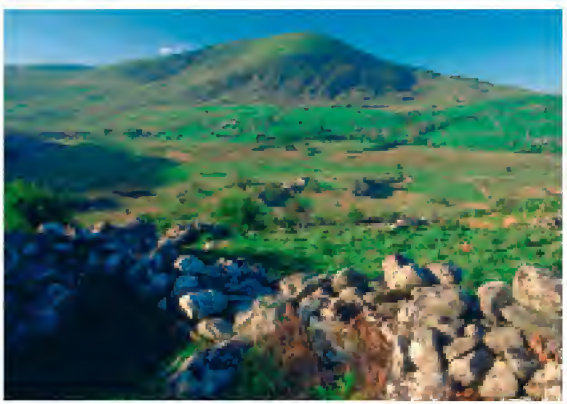
Delegates then heard from Naomi Jones about a splendid community-based project which mapped place names, promoted drovers' trails, put on artists' exhibitions and in other ways promoted cultural tourism in the Snowdonia National Park. John Rodwell contributed a powerful plea for valuing nature and culture together, as well as pointing out how well-adapted the sycamore, a ravine tree that does not like hot and dry places, was to these parts. Bob Haycock gave a fascinating account of the history of the Ministry of Defence at Castlemartin, and of the area's exceptional wildlife.

Other speakers continued the theme, weaving together human and natural history. For me the highlight of the conference was the luxury of spending a whole day in expert company visiting places which exemplified the theme. Prised out of our beds for an early start, my group first visited the Clwydian Range to learn about the *Heather and Hillforts* project. We ascended a hill in glorious sunshine, but as we approached a folly at the top, the wind got up, and it was barely possible to stand upright. Sun and wind, landform and nature, are great aides to memory and learning. We heard about the technology being used to inform visitors of the area's history, about its close connections with Liverpool, about management for black grouse adjacent to afforested areas and the challenges of burning. Public perceptions of what is going on can be entertaining, as when members of the public spontaneously applauded when a controlled burn was completed, in the belief that a major fire had been put out.

Halkyn Mountain provided an equally stimulating prospect. Lying over carboniferous limestone, pocked by hundreds of lead and zinc shafts, it was the setting for homes and quarries, an entire community. Given the nature of the landscape, our group thought that Halkyn Hills and Holes would have been a better name.

Another seven speakers, all interesting, all different, entertained us on the final morning. Mike Alexander then reported on the state of the organisation NATUR. This should be launched formally as a membership organisation at the Royal Welsh Show. Judging by the Conference, NATUR is doing something very valuable and precious, in bringing people together across the broad heritage sector, and giving such stimulating food for thought. It is an important enterprise, which deserves to, and should succeed. Welsh heritage and nature need NATUR!

James Robertson



Jeremy Moore/CCW

Hysbysfwrdd / Noticeboard

If you would like your wildlife event to feature on these pages please contact us on 01248 387373 or email info@naturcymru.org.uk (entries may be edited). Please mention Natur Cymru if you attend any of these events.

British wildlife photography awards

UP TO £15,000 WORTH OF PRIZES AND EXPOSURE IN A TOURING EXHIBITION FROM 24 SEPT 09

British Wildlife Photographer £5,000
Young British Wildlife Photographer (under 18) £500
Schools, Youth and Community Group Award £1,000
Category Awards:

- Animal portraits
- Animal behavior
- Urban wildlife
- Hidden Britain
- Coast and marine
- Wildlife in my locality
- Habitat; Animals in their environment. Plants and their partners.

The winner of each category will receive prizes with a value of around £1,000.
Closing date 31 July 2009. Submit entries on-line or via post.
Full details can be seen on the competition website:
www.bwpawards.org

Fenn's, Whixhall & Bettisfield Mosses NNR

EVENTS
28 Jun *Dazzling Dragonflies & Damselflies Walk* 2pm with Emma Broad
26 Jul *Bogs are Brilliant!* An insight into the management and special wildlife of the Mosses and how bogs help with climate change, with Joan Daniels.
5, 12, 19 & 26 Aug *'Mad about the Mosses'* 10am-1pm. Children's activity days including **All About Birds, Bog Safari, Ditch Dipping** & **Treasure Trail** – Suitable for ages 5+.
14 Aug *Creatures of the night* 8pm. For the first time ever, come see the Mosses by night. Bring your insect repellent!
30 Aug *Woodcarving Prehistoric Pines on the Mosses Day* 11am. Join David Gerty of the British Woodcarvers Association on this woodcarving workshop to include a walk on the Mosses to search for ancient pine.
6 Sept *A Peat Cutter's life* 1pm. A stroll around Fenn's Moss with Bill Allmark, a former peat cutter, to learn how life on the Mosses used to be and why the cutting had to stop.
All events are free but **booking is essential** (except talks). Full details/booking Caroline Dahn **0300 060 0583** or email **caroline.dahn@naturalengland.org.uk**

North Wales Wildlife Trust

ANNUAL LACEY LECTURE
The Past and Future of Fish and Fishing
23 Oct Main Arts Lecture Theatre, University of Bangor
Prof Callum Roberts, author of *Unnatural History of the Sea*
Further details **01248 351541**
nwwt@wildlifetrustswales.org

Plas Tan y Bwlch

Canolfan Astudiaethau a Gwasanaethau Addysg/Environmental Studies and Education Centre, Snowdonia
PROFESSIONAL TRAINING COURSES
Discounts for those working in Wales
29 Jun – 3 Jul *Woodland Conservation Management*
19-21 Oct *A Duty For Biodiversity – Delivering Benefits For All*
Aims to increase awareness of the fundamental importance of biodiversity to the economy, to health and to society, and of the supporting legislation. To discuss course content please contact Julia Korn **j.korn@ccw.gov.uk**
To book: **01766 772600, plas@eryri-npa.gov.uk, www.plastanybwlch.com**

School of Education and Lifelong Learning, Aberystwyth

COURSES IN 2009
Identifying Flowering Plants
26-28 Jun Denmark Farm Conservation Centre, Lampeter
3-5 Jul CAT, Machynlleth
Butterfly Survey, 4 sessions starting **14 Jul,** Denmark Farm Conservation Centre, Lampeter
Entomology: The Larger Insects of Wales, 4 sessions starting **1 Aug**, Welsh Wildlife Centre, Cilgerran Pembs. Full details: **learning@aber.ac.uk, 01970 621580, or www.aber.ac.uk/sell**

Shared Earth Trust

COURSES
Denmark Farm Conservation Centre, Lampeter
29 Jun-1 Jul *Introduction to the Identification of Grasses, Sedges and Rushes* £195/£130
2-3 Jul *Vegetation Survey - a practical introduction* £150/£100
7 Jul *Grassland Restoration (in partnership with Flora locale)* Free
3-4 Aug *Grassland Invertebrates - survey and identification* £150/£100
16 Sept *Wildlife Monitoring - an introduction for amateurs* £60
23 Sept *Biodiversity Monitoring for Professionals* £75
Contact **01570 493358** or see **http://www.shared-earth-trust.org.uk**

WWT

National Wetland Centre Llanelli, Carmarthenshire SA14 9SH, 01554 741087
info.llanelli@wwt.org.uk
www.wwt.org.uk
20 Jul-4 Sept *Summer Fun* for all the family. Pond-dipping, canoe safari, bike trail, walks, art & craft activities and much more!
25-26 Jul *Flamingo Festival* - a celebration. What makes them pink? What makes them flap and dance? Come and find out what we are doing to look after them across the world.
20 Aug 5.30pm & 18 Sept 5pm *High Tide Watch & BBQ* Discover the amazing sights and sounds as the advancing tide pushes the birds closer to the hides. Booking Essential. £10.
12 or 13 Sept *Tim Collier Basic Photography Course* 10am-4pm. £38, lunch included. Booking essential.

Puffins

Mike Alexander

Diolch am y lluniau i / For illustrations, thanks to:
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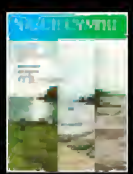

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